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MAIER (W.). **Zur Frage der Stäubewirkung der Kupferkalkbrühe bei der Bekämpfung von Plasmopara viticola.** [On the question of the dust action of Bordeaux mixture in the control of *Plasmopara viticola*.]—*Wein u. Rebe*, xxiii, pp. 65–72, 1941. [Abs. in *Chem. Zbl.*, cxii (ii), 22, p. 2724, 1941.]

In experiments at the Geisenheim [Rhine] Horticultural Research Station the infection of vines by *Plasmopara viticola* was successfully combated by the application of Bordeaux mixture dust to the leaves at the rate of 0·03 mg. per sq. cm., the threshold of toxicity lying at 0·01 mg. The action of Bordeaux mixture in dust form is not, however, strictly comparable to that of the dusts proper.

STOREY (H. H.). **Plant pathology.**—*Rep. E. Afr. agric. Res. Sta., 1940*, pp. 7–8, 1941.

In this report [cf. *R.A.M.*, xx, p. 102], the author states that breeding work for resistance to cassava mosaic [ibid., xx, p. 517] and brown streak [ibid., xx, p. 103] has been continued in East Africa. Field tests are made in two stages, a preliminary, unreplicated trial to eliminate the more susceptible clones, and a fully replicated trial. In 1940 two large-scale tests, each of 100 clones in a triple lattice design, were completed, and at the close of the year two further trials, on a changed design, with 96 clones, were planted. The results so far obtained in this work show that few of the 108 varieties imported from overseas are as resistant as the local ones, and most of them have been discarded. Of the cassava × cassava crosses, a few appear, to judge from a single trial, to be more resistant to one or both of the virus groups than any local variety. The *Manihot glaziovii* × cassava hybrids show high field resistance to both groups, though most of them are susceptible to infection by grafting. All the *M. dichotoma* × cassava hybrids except one have resisted the mosaic virus both by grafting and by field infection, and only a few are susceptible to brown streak.

The resistance to streak claimed for the inbred lines of Peruvian Yellow Flint maize [loc. cit.] received from Barberton was again experimentally confirmed.

LARTER (L. N. H.). **Report of the Plant Pathologist.**—*Rep. Dep. Sci. Agric. Jamaica, 1940–41*, pp. 13–14, 1941.

CROUCHER (H. H.). **Report of the Leaf Spot Control Officer.**—loc. cit., pp. 14–15.

LEACH (R.). **Report of the Leaf Spot Mycologist.**—loc. cit., p. 15.

In his report on plant disease work in Jamaica [cf. *R.A.M.*, xx, p. 153] the Plant Pathologist states that during the period under review Panama disease of bananas (*Fusarium oxysporum* [var.] *cubense*) continued to spread steadily. The number of cases treated amounted to 781,077, including 1,210 new cases, but the decrease since the previous year indicated by these figures is only apparent, as treatment has now been abandoned over large areas, where infection is no longer controllable.

Bacterial heart rot of bananas was occasionally observed, but there was no sign that the disease is becoming serious.

A local outbreak of banana fruit stalk rot (navel rot) occurred in parts of St. Thomas.

This condition, apparently not previously recorded, consisted in a progressive rot of the fruit stalk, beginning in the interior of the terminal inflorescence bud ('navel') and spreading back along the peduncle until, in some cases, the fruit was reached. As a rule, plants became affected when the fruit was from half to three-quarters full, and environmental conditions caused cessation of filling out of the fruit, followed by premature ripening, rotting, and shedding of the fingers. No primary pathogenic organism was associated with the disease, which, apparently, was not infectious. Abnormal soil moisture conditions may have been responsible. As a precaution, the navels were removed when the fruit was half mature, with the result that the disease practically disappeared.

Coco-nut bronze leaf wilt [loc. cit.] remained confined to the north-west of Jamaica, where, except on a few properties, it has to a large extent destroyed the coco-nut cultivations. Its rate of spread has, however, much decreased, and it has not extended to the adjoining parishes of Trelawny and Westmoreland.

Rust (*Puccinia psidii*) [loc. cit.] continues to be the limiting factor in the pimento (*Pimenta officinalis*) crop.

With increased groundnut production the disease situation has become more serious. Root rot (*Sclerotium rolfsii*) [ibid., xix, p. 579] was frequently reported, and caused heavy losses. Rust (*P. arachidis*) [ibid., xix, p. 261], though seldom severe, is widespread. Wilt (*Fusarium* sp.) [cf. ibid., xix, p. 62] appears likely to become more troublesome. Other groundnut diseases observed include damping-off (? *Phoma* sp.), leaf blight (*Gloeosporium* sp.), and leaf spot (*Cercospora personata*) [ibid., xx, pp. 448, 450]. Both the last-named disease and *Fusarium* wilt appear to be new records for Jamaica.

A few severe, isolated outbreaks of cassava leaf spot (*C. henningsii*) [ibid., xx, p. 445] following the autumn rains cleared up after spray treatment.

New records (other than those cited above) included sunflower rust (*Puccinia helianthi*), and leaf spot (*Diplodia macrospora*) and a heart rot (apparently bacterial) of maize.

In the report by the Leaf Spot Control Officer it is stated that the intensity of banana infection by the disease [*C. musae*: ibid., xx, pp. 153, 412] was subject to the usual seasonal fluctuations. Control in certain areas, particularly in the Western Division, was made difficult by rain. Towards the end of 1940 high winds and low temperatures severely affected the appearance of the bananas. In sections of St. Mary and St. Catherine unfavourable weather and unsatisfactory cultivation were more important factors than leaf spot. Good quality fruit is still produced in the absence of control in the eastern parishes, though the average intensity of infection here has increased. The total number of growers in Jamaica who regularly practise spraying is estimated at about 900. All who have been issued with equipment are visited by officers of the company with which they have a contract, who are responsible for the supervision of the spraying. Two properties were taken over for field experiments and planting out was to be done in April and May, 1941. Investigations are to be based on the assumption that if the crop is to bear the additional expense of spraying, production per acre must be increased.

The Leaf Spot Mycologist [cf. ibid., xx, p. 265] states that present spraying methods achieve control by reducing sporulation on sprayed spots and by rendering the dew toxic to any spores produced on the treated leaves. Comparative tests with Bordeaux mixture and perenox (both in use under the direction of the Banana Leaf Spot Control Board) showed that the former suppresses sporulation much more effectively than the latter, while, vice-versa, dew from perenox-sprayed leaves is more toxic to germination than dew from leaves sprayed with Bordeaux mixture. Preliminary tests with heart-leaf spraying, using a spray with a high wetter content, have resulted in a remarkably high level of control, and may form a basis for improved spraying methods, especially for small growers.

I Congresso nacional de Ciências naturais. Comunicações. [First National Congress of Natural Sciences. Communications.]—*Rev. agron., Lisboa*, xxix, 1, pp. 96, 100, 107–110, 115–117, 1941.

The following are summaries of papers presented at the First National Congress of Natural Sciences, held in Lisbon from 6th to 11th June, 1941. R. V. De G. Cabral, dealing with the serious olive disease caused by *Gloeosporium olivarum* [*R.A.M.*, xiv, p. 596], states that inoculation experiments on the fruits of olive and grapefruit gave uniformly positive results, all other parts of the plants, however, reacting negatively. The optimum temperature for the development of the pathogen was found to be 27° C., but spore production was equally abundant at 22° and 24°.

The fourth contribution by M. De S. Da Camara and C. G. Da Luz to the fungi of Portugal [cf. ibid., xix, p. 365] comprises 69 species, including 37 not previously recorded in Portugal.

B. D'Oliveira describes the reproductive and cytological processes in the rusts *Puccinia anomala*, *P. rubigo-vera* [ibid., xx, p. 353], *Tranzschelia* [*P.*] *pruni-spinosae*, *Uromyces graminis*, *U. fabae* [ibid., xix, p. 167], and *U. vignae* [ibid., x, p. 810], with special reference to the intervention of the sexual phase in the formation of new physiologic races or even varieties. The same author discusses the physiological relations of *Darluca filum* [ibid., xx, p. 570] and *Tuberculina* spp. with the rusts which they parasitize and the hosts of the latter. Observations on infected tissues led to the conclusion that the secretions of the rusts, or the metabolic products of the host, rather than the rusts themselves supply the hyperparasites with nutriment. *D. filum* was found to be associated exclusively with the uredo-teleutospore phase, and *T. persicina* [ibid., xix, p. 433] with the aecidial phase of *U. vignae* on the same cowpea leaf.

B. D'Oliveira and Maria De L. V. Borges showed that the mycelium of *P. pruni-spinosae* in the rhizomes of *Anemone coronaria* [cf. ibid., xx, p. 81] perennates in a haploid condition, even in plants with fertile aecidia on the leaves.

B. D'Oliveira and A. A. L. Pimentel observed *Melampsoridium betulinum* [ibid., xv, p. 326] to be widespread in the uredo- and teleutospore stages on *Betula celtiberica* in the province of Tras-os-Montes, where the alternate host (larch) is rare. Laboratory experiments in the spring of 1940 showed that the dissemination of the rust may be effected by the uredo stage and by dormant bud infections.

Maria De L. D'Oliveira concludes, from a perusal of the relevant literature, that a virus disease of onion, garlic, grape-hyacinth (*Muscari comosum*), and *Narcissus tazetta* observed in the spring of 1940 is identical with yellow dwarf [ibid., xx, p. 442], but cross-inoculation experiments have not yet been undertaken.

The following bacterial diseases have been studied by Maria De L. D'Oliveira and R. V. De G. Cabral: *Phytomonas* [*Pseudomonas*] *savastonoi* on olive [ibid., xx, p. 504], *Bacterium ligustri* on privet (*Ligustrum japonicum*), *Erwinia carotovora*, causing a soft root rot of various horticultural plants, *Bact.* [*Xanthomonas*] *juglandis* on walnuts, *Bact.* [*X.*] *phaseoli* on beans [*Phaseolus vulgaris*] in Madeira but not encountered in Portugal, *Phytomonas* [*Pseudomonas*] *syringae* on lemons [ibid., xix, p. 274], and *Phytomonas begoniae* (Takimoto) comb. nov. [but see Bergey, Manual of determinative bacteriology, p. 162, 1939: *X. begoniae* (Buchwald) Dowson] on *Begonia tuberosa*.

A. T. De Vasconcellos and B. D'Oliveira studied the pathogenicity of *Saprolegnia parasitica* to various kinds of fresh-water fish [*R.A.M.*, xviii, p. 799], which suffer severely from its attacks, notably in tanks and aquaria. The fungus was isolated in pure culture and found to be capable of infecting unwounded fish living under hygienic conditions.

A. Zagallo, studying the influence of temperature on the development of *Coryneum longistipitatum* [a pathogen of pear: cf. ibid., x, p. 704] on Dox's agar, found that conidial germination takes place at a range of 2° to 28° C., with an optimum at 22°,

at which 97·8 per cent. germinate in nine hours, the same temperature also favouring mycelial growth. The temperature range for conidial production lies between 5° and 22°, with an optimum at 12°.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, lii, 12, pp. 642–645, 6 figs., 1941.

Under New South Wales conditions bean rust (*Uromyces phaseoli typica*) [*U. appendiculatus*] is almost exclusively confined to the climbing varieties of French beans [*Phaseolus vulgaris*: *R.A.M.*, xx, p. 556], among which Epicure is particularly susceptible, followed by Kentucky Wonder and Glory of Summer. Pending the development of resistant varieties, control should be based on early planting, enabling the crops to outdistance the rust, and the weekly or fortnightly application, at the first sign of infection, of a dust consisting of equal parts of sulphur and hydrated lime.

Besides tomatoes, which have again sustained heavy damage by the spotted wilt virus in recent months, lettuce, potatoes, tobacco, and a number of popular ornamentals are subject to infection. Sanitary measures against the disease should comprise the exclusion of susceptible flowering plants, such as dahlia, *Zinnia*, and nasturtium [*Tropaeolum majus*] from the vicinity of tomato plots; prompt removal and destruction of diseased plants on the first sign of the disease; washing the hands in soapy water before renewed contact with healthy plants; destruction of weeds in the neighbourhood of the plots; staking and pruning of the plants; and (for smallholders) postponement of planting until December so as to avoid severe attacks.

Heavy losses have been caused from time to time during recent years in the late cherry-producing districts of the Central and Northern Tablelands by brown rot (*Sclerotinia fructicola*), amounting at Orange, for instance, from 1933 to 1935 to between £10,000 and £15,000. One of the means of combating this destructive pathogen consists in the application, during the week before picking, of a sulphur-containing fungicide, e.g., lime-sulphur 1 in 160, colloidal sulphur 2 in 100, or a combination of the two at half the strengths indicated. Alternatively, copper oxychloride (available on the market under the names of soltosan, cuprox, and oxy-cop) is tentatively recommended at the rate of 1 lb. per 160 gals. water; this compound, unlike Bordeaux mixture, does not leave an unsightly deposit on the fruit. Bordeaux mixture has also been found effective against prune rust [*Puccinia pruni-spinosae*], but its use in non-irrigated areas tends to cause severe leaf scorch, and copper oxychloride (as before) or lime-sulphur (1 gal. per 160 gals. water) is accordingly recommended as an alternative; colloidal sulphur (1 to 2 lb. per 100 gals.) or wettable sulphur (2 to 5 lb.) should be combined with either of the compounds, which are normally applied once in late October and again between mid-December and mid-January.

New disease records for October, 1941, include leaf spot of foxglove (*Digitalis purpurea*) caused by *Ramularia variabilis* [ibid., ix, p. 185], ergot of red grass (*Bothriochloa* sp.) due to *Claviceps pusilla* [ibid., xxi, p. 82], crown rot of silver beet (*Beta vulgaris*) (*Rhizoctonia* [*Corticium*] *solani*), and *Epichloe cinerea* on Parramatta grass (*Sporobolus indicus*).

Divisions of Plant Pathology and Seed Investigations.—*Rep. N.Y. St. agric. Exp. Sta., 1940–1*, pp. 33–40, 50–55, 1942.

During the period under review [cf. *R.A.M.*, xx, p. 244], apple scab (*Venturia inaequalis*) was, as usual, effectively combated by wettable sulphurs, a number of which were found to be improved by the admixture of 1 in 100 spray lime, especially if orthex [ibid., xviii, p. 236] is included in the formula as a sticker, or under humid conditions. Magnetic '70' and the flotation sulphur pastes should be applied at the rates of 5 and 10 in 100, respectively. Of the dry wettable sulphurs, the micronized (5 in 100) proved to be the most toxic to the fungus. Bordo $\frac{3}{4}$–6–100 plus micronized sulphur $2\frac{1}{2}$–100 caused the least copper injury of any copper material tested in the

first cover spray, possibly excepting coposil, but the sulphur content still exceeds the safety limit if the second cover is to include summer oil. The most promising of the new preparations tested was IN870, a Du Pont organic compound, which was also highly specific against the cedar rusts [*Gymnosporangium juniperi-virginianae* and other *G.* spp.]. Ground treatments of 0·5 per cent. elgetol [ibid., xxi, p. 82] or ammonium sulphate (100 lb. per 100 gals. water) plus a penetrating agent, applied before the green tip stage was reached, gave excellent control of scab in orchards with a heavy carry-over, whereas 10 per cent. infection developed on the fruit in comparable sites where the ground spray was omitted.

Lime-sulphur and flotation sulphur controlled leaf spot (*Coccomyces hiemalis*) on Montmorency cherries [ibid., xxi, p. 148] only when applied before infection periods, magnetic '70' sulphur paste being far superior to the foregoing in a test on the Morello variety in which the disease became established at the time of the 'shuck' spray, while in another trial under more exacting conditions the insoluble coppers, especially No. 375 (U.S. Rubber Co.), definitely surpassed the sulphur preparations in toxicity to the pathogen. The high degree of efficacy of Bordo 1½–6–100 was counterbalanced by its tendency to injure the trees and reduce yields. Bordow was the best of the dry commercial coppers used in the experiments, but the most successful of all the materials tested was IN870.

Outstanding results in the control of raspberry spur blight (*Didymella applanata*) over an experimental period of three years [ibid., xx, p. 245] have been obtained by the application of 1 per cent. elgetol to the canes when the green tips protrude about ¼ in. from the buds.

Two applications of Bordeaux 3–3–100, the first when the fruits are about half-grown and the second after picking, were equally effective with the 8–8–100 formula and the insoluble coppers against currant leaf spots (*Mycosphaerella grossulariae* and *Pseudopeziza ribis*), which were also eliminated from gooseberries by an insoluble copper or high-lime Bordeaux. Powdery mildew of gooseberries (*Sphaerotheca mors-uvae*) yielded to a single application of 1 in 50 lime-sulphur.

Spergon [ibid., xx, p. 241], cuprocide, and semesan, used at the rates of 1 to 2, 2½, and 2½ oz. per bush., respectively, were the best of the pea seed disinfectants tested, producing yields from half-acre plots of 200 to 1,800 lb. more shelled peas per acre than the untreated controls. Cuprocide, however, caused moderate injury in two fields, while new improved ceresan (1 oz.) consistently retarded growth and reduced output. Foot and root rots (chiefly associated with *F. solani* var. *martii* f. 2 and *Aphanomyces euteiches* [ibid., xx, p. 245]) were prevalent and severe during the damp growing season of 1940, but notwithstanding the presence of disease the average yields exceeded those of the past ten years by some 400 lb. per acre. Of the fungi concerned, *F. solani* var. *martii* f. 2 has been found to occur annually in a destructive form over the last four years, irrespective of weather conditions; in a wet planting season it may also be responsible for serious seed decay. *A. euteiches* is more dependent on the weather, being unimportant or absent during a dry spell. *Pythium ultimum* and *Corticium solani* may both be implicated in the causation of foot and root rots, but the former is primarily pathogenic to seed and seedlings and the latter has never been observed in connexion with an epidemic.

Satisfactory control of tomato blight [*Septoria lycopersici*] was secured by treatment with Bordeaux mixture 4–2–50, copper oxychloride sulphate, Grasselli compound A, cuprocide 54–Y, yellow cuprocide, and Tennessee tribasic [ibid., xx, p. 181], the gross return from spraying on half-acre blocks in commercial fields being computed at $13 to $54 per acre.

Three out of five lines of mosaic-resistant hybrid Refugee beans [*Phaseolus vulgaris*: ibid., xx, p. 245] produced at the Station outyielded U.S. No. 5 and Idaho Refugee, but only one of these was adapted for canning purposes.

For the control of hop downy mildew [*Pseudoperonospora humuli*: ibid., xx, p. 246]

yellow cuprocide 1 in 100 should be substituted for Bordeaux in the early June sprays, when the latter preparation may cause severe leaf and shoot injury, and in those of August to obviate the adhesion of a deposit to the fruit. Preventive treatments were effective except in yards where infection had reached the upper parts of the vine before the application of the first spray. In situations promoting such premature development of the fungus weekly roguing of the basal spikes resulting from primary infection was necessary. Timely spraying or dusting with sulphur was efficacious against powdery mildew [*Sphaerotheca humuli*], while both hop diseases proved amenable to a combination of sulphur and red cuprous oxide dusts containing 6 per cent. by weight of copper. Tests are in progress of several hop varieties showing promise of resistance to both pathogens.

Fusarium moniliforme [*Gibberella fujikuroi*] developed in 30 per cent. of the routine germination tests of field maize, and was also found in 91 out of 94 samples of field and 18 out of 21 of sweet maize collected by State inspectors [ibid., xx, p. 528; xxi, p, 72].

Crucifer seeds sold in packets are commonly infected by *Alternaria brassicae* and *A. circinans* [*A. oleracea*: ibid., xix, p. 636], both of which, together with *Rhizopus nigricans*, are usually eliminated by ethyl mercury tartrate, phenyl mercury cyanamide, and other mercury compounds in laboratory tests.

BITANCOURT (A. A.). **Plant diseases observed in the State of São Paulo in 1939 and 1940.**—*Int. Bull. Pl. Prot.*, xv, 12, pp. 221M–223M, 1941.

The following, in addition to records already noted from other sources, are among the diseases observed in São Paulo, Brazil, in 1939 and 1940 [cf. *R.A.M.*, xix, p. 329]: *Himantia stellifera* on sugar-cane [ibid., xviii, p. 346], *Cytospora cydoniae* Rangel on quince, *Entyloma dahliae* on *Dahlia variabilis*, *Uromyces fabae* on broad bean, *Fusarium moniliforme* [*Gibberella fujikuroi*] on fig, *Cercospora fusca* on pecan [ibid., xix, p. 330], *Fabraea maculata* on apple, *C. krugiana* on *Boehmeria nivea* [ibid., xvi, p. 344], *Botryobasidium* [*Corticium*] *solani* on tobacco, and *F. bulbigenum* var. *lycopersici* on tomatoes.

Informe anual correspondiente al año agrícola 1940–1941. [Annual report for the agricultural year 1940–1941.]—*Bol. Chacra exp. 'La Previsión'*, iii, 2, pp. 59–81, 110–111, 5 graphs, 1941. [English summary.]

Among the items of phytopathological interest in this report on the work of a co-operative experimental farm in the province of Buenos Aires, Argentine, in 1940–1, may be mentioned the following. Foot rot (*Ophiobolus graminis*) [*R.A.M.*, xv, p. 209] occurred sporadically, causing heavy damage to the summer wheats (*Triticum durum*) used in the manufacture of spaghetti, infection being favoured by the almost universal practice of sowing the new crop among the stubble of the foregoing.

Brewing barleys were heavily infected by the leaf-spotting fungi, *Helminthosporium* spp. [ibid., xv, p. 296] and *Rhynchosporium* [*secalis*].

The most important flax disease was 'spasm' (*Septoria linicola*) [*Sphaerella linorum*: ibid., xx, p. 18], rust (*Melampsora lini*) and wilt (*Fusarium lini*) causing relatively little injury.

Tables are given showing the results of inoculation experiments with *Tilletia* [*caries* and *T. foetida*] on a number of wheat varieties, some of which were tested over a seven- and others over a six-year period. The only resistant variety in the former lot (average infection from 1934 to 1940, 0·9 per cent.) was a selection of Kanhard made at 'La Previsión'; two were semi-resistant, viz., Kanred and Kanhard (6·9 and 13·8 per cent., respectively), Eureka was semi-susceptible (36·3), while the 'La Previsión' selections 34 and 25 were susceptible, with 64·6 and 74·5 per cent. infection, respectively. The six-year group comprised three resistant varieties, namely, Oro, a summer wheat selection made at 'La Previsión', and Cooperatorka selection M.A. (average infection from 1935 to 1940, 0·3, 1·2, and 3·3 per cent., respectively), and three semi-

susceptible, i.e., Reliance selection Klein, Sola 50–10/33, and Standard (18·8, 34·7, and 44·7, respectively). A 'common' summer wheat (pure *T. durum*) tested in four seasons only was resistant (2·8 per cent. infection from 1937 to 1940), the corresponding figure for a type comprising an admixture of *T. aestivum* being 10 per cent.

Of the four barley varieties tested for their reactions to *Ustilago hordei* during the five-year period from 1936 to 1940, only one (Fodder R.M.85) was resistant, with an average infection of 0·7 per cent. resulting from the inoculation of hulled seed, the other three, viz., Aclimatada Rivera, La Previsión 19 (both brewing), and Fodder Trebi, being semi-resistant, with 7·5, 9·1, and 9·5 per cent. infection, respectively, while the corresponding percentages for dehulled seed were 7·9, 47·0, 49·1, and 34·7, respectively. A brewing selection, II–13×F.common 37–1, and a fodder barley, II–13×F.common 7–2, were both tested in three seasons, during which the former was resistant (2·8 and 19·3 per cent. infection for hulled and dehulled seed, respectively, from 1938 to 1940), and the latter susceptible (9·7 and 43·8 per cent., respectively).

La Previsión 34 wheat severely attacked by *Puccinia graminis tritici* in 1940–1 was divided into three different lots for harvesting, of which (1) and (2), containing 40 and 21 per cent. moisture, respectively, were cut on 26th December and 1st January, respectively, and left lying in rows in the field until 23rd January, while (3), with 10 per cent. moisture, was gathered on 16th January; the yields from the three lots amounted to 82, 99, and 229 kg. per ha., respectively, the 1,000-grain weights being 14·42, 15·90, and 13·72 gm., respectively.

Brown (Nellie A.). **The effect of certain chemicals, some of which produce chromosome doubling, on plant tumors.**—*Phytopathology*, xxxii, 1, pp. 25–45, 2 figs., 1942.

From this detailed, fully tabulated account of the writer's experiments on the action of various chemicals on plant tumours caused by *Bacterium tumefaciens*, it appears that the chromosome-doubling chemicals acenaphthene, α-methylnaphthalene, α-nitronaphthalene, 3–5–dibromopyridin, and apiole did not induce excessive doubling of the chromosome of young tumours like colchicin [*R.A.M.*, xix, p. 461]. The only stimulus to growth conferred by acenaphthene took place in young galls on French marigold (*Tagetes patula*) and Paris daisy (*Chrysanthemum frutescens*) brushed with this substance dissolved in chlorinated naphthalene, and temporarily also in the former host watered with a saturated aqueous solution of acenaphthene. Dissolved in dioxan, acenaphthene failed to induce the marked gall enlargement before inhibition and death typical of the effects of colchicin treatment. Marigold tumours were not killed by 3 per cent. acenaphthene in dioxan, which was, however, lethal to galls on *C. frutescens* of 36 days old and upwards. Generally speaking, any inhibition of growth in marigold tumours due to acenaphthene was overcome, and at maturity the treated galls were no smaller than the controls.

Galls brushed with full-strength apiole, an oily, non-volatile compound extracted from parsley seed, did not attain their normal size, but were not killed by the treatment. On the other hand, full-strength α-methylnaphthalene, brushed on young marigold and *C. frutescens* tumours, suppressed further growth and killed old but still developing galls on both hosts, much the same effects being produced by a 50 per cent. emulsion of the compound, using santomerse [ibid., xix, p. 187; xxi, p. 111] as the emulsifying agent. Applications of α-methylnaphthalene to the excrescences on two related hosts, *Bryophyllum pinnatum* and *Kalanchoë daigremontiana* [cf. ibid., xvii, p. 798; xviii, p. 580], failed to retard the growth of those on the former, while the galls on the latter were dead in a fortnight.

Uniformly negative results were obtained with α-nitronaphthalene and 3–5–dibromopyridin in saturated water solutions and lanoline paste. Two chemicals used by animal pathologists in the control of mouse tumours, viz., heptyl aldehyde and

methyl salicylate, were included in the trials. Used at full strength normal heptyl aldehyde destroyed twelve 14-day-old marigold tumours in 24 hours, while only slight shrinkage occurred in the same number of 18-day-old galls on *C. frutescens*, half of which survived the treatment and continued to grow. In a 20 per cent. emulsion the same compound killed twenty 25-day-old marigold tumours in three days, but did not injure those of a week old: ten 46-day-old galls on *C. frutescens* succumbed to a 10 per cent. emulsion of heptyl aldehyde. Full strength α-methyl salicylate killed 30- to 44-day-old tumours on marigold, but not those of 12 to 15 days: in the case of *C. frutescens*, 16- to 26-day-old excrescences were killed and those of a week old inhibited by brushing with the chemical.

Waksman (S. A.), Woodruff (H. B.), & Horning (Elizabeth S.). **The distribution of antagonistic properties among Actinomycetes.**—Abs. in *J. Bact.*, xlii, 6, p. 816, 1941.

On the basis of their chemical properties and biological activities the active substances so far demonstrated for Actinomycetes can be divided into four groups, viz., (1) actinomycetin, (2) the lysozyme type of substance studied by Russian workers, (3) actinomycin, isolated from *Actinomyces antibioticus* [*R.A.M.*, xx, p. 595], and (4) streptothricin, a new type of compound on the isolation of which the writers are at present engaged. It is water-soluble, thermostable, less toxic, but much more specific in its bacteriostatic action, particularly against various Gram-negative organisms.

Allcroft (Ruth). **Antibacterial agents derived from micro-organisms with special reference to gramicidin.**—*Vet. Bull., Weybridge*, xii, 1, pp. R1–R6, 1942.

The author reviews and discusses the results obtained in recent research on antibacterial agents derived from micro-organisms, including (among others) penicillin [*R.A.M.*, xx, p. 484], Glister's agent from *Aspergillus* (?) [ibid., xxi, p. 67], actinomycin [see preceding abstracts], and gramicidin. The last-named, which exerts a strongly bacteriostatic and bactericidal effect on Gram-positive micro-organisms, is best obtained from *Bacillus brevis*. Very promising results with gramicidin have already been obtained in the control of chronic bovine mastitis.

Melchers (L. E.). **The Wheat stem rust epidemic of Kansas in 1940.**—*Plant Dis. Reptr, Suppl.* 132, pp. 95–103, 3 graphs, 1 map, 1941. [Mimeographed.]

During the six-year period from 1935 to 1940 the total loss from black rust of wheat (*Puccinia graminis tritici*) in Kansas equalled or surpassed the combined reduction for all previous seasons since the epidemic of 1904. In 1935, 1937, 1938 [*R.A.M.*, xix, p. 203], and 1940 the losses incurred as a result of the disease were of major significance, the decrease in yield for the State in the last-mentioned year being estimated at 7 per cent., or roughly 9,321,892 bush. A graph of the daily precipitation and maximum and minimum temperatures from 1st April to 30th July indicates that moisture was favourable up to the middle of July but the temperatures remained too low throughout April for rust development. Several prolonged as well as short periods favourable to infection occurred from 5th May to 12th June and it was during these periods that infection spread and made way for the epidemic that followed. The main favourable periods were later in 1940 than in other years and continued into late June and the first two weeks of July, whilst the wheat crop in southern, central, and parts of eastern Kansas was 10 to 14 days late and stem rust consequently had time to spread and injure the crop. The wheat crop in the north-central counties was a fortnight in advance of the crop in the southern part and remained rust free.

Attempts are in progress to secure a rust-resistant hard red winter wheat by hybridization, none of the varieties of this type at present grown in the State being satisfactory in that respect; of the other hard kinds, Early Blackhull, Blackhull, Kawvale, and Iobred sustained the least damage.

Săvulescu (T.). **Wheat rusts and Wheat scald during the year 1940. II. Scald.**—*Int. Bull. Pl. Prot.*, xv, 11, pp. 201M–205M, 1941.

The poor Rumanian wheat crop of 1940 is attributed largely to a physiological disturbance known as 'scald', aggravated by rusts [*Puccinia* spp.], particularly black rust [*P. graminis*]. 'Scald', which results in the production of small, light, shrivelled grain, was most prevalent in districts where heavy rains caused lodging and in those where the crop was overtaken by excessive heat in the 'milky' stage. An attack of 'scald' at this juncture causes the premature desiccation not only of the grain, but also of the last internode of the stalk, thereby precluding the normal synthesis of reserve substances. 'Scalded' grains are apt to develop cracks in the tegument, especially near the embryo, which may also suffer damage, while injury is further liable to arise from the percolation through the fissures of the chemical solutions or dusts used for disease control. 'Scalded' seed-grain usually germinates normally, but the seedlings are small, weak, with stunted roots, and often fail to tiller; if the autumn is dry, many die off, and in the winter they are very susceptible to frost. In 1940 the combined losses from rust and 'scald' amounted to between 50 and 70 per cent. of the normal crop. 'Scald' was particularly severe on the spring varieties, Ulca and Arnaut, while *Triticum ferrugineum* sustained heavier damage than *T. erythrospermum*, and awned varieties were more severely attacked than unbearded ones.

Preventive measures against scald should include the replacement of unselected populations by pure lines, e.g., American 15, adapted for cultivation in the several wheat-growing regions of Rumania and characterized by resistance to cold, drought, scald, and rusts rather than high productivity; strict attention to cultural operations; ceaseless vigilance in the pursuance of the barberry eradication campaign, especially in the Carpathians, Prahova and Siret Valleys, and Danube Delta, where the bushes form veritable thickets; and the sowing of larger quantities of seed-grain than usual in the autumn following 'scald' attacks so as to compensate for losses during germination and in consequence of winter frosts.

Holton (C. S.) & Suneson (C. A.). **Varietal reaction to bunt in the western Wheat region of the United States.**—*J. Amer. Soc. Agron.*, xxxiv, 1, pp. 63–71, 1942.

The results obtained from 1932 to 1940 with 83 wheat varieties and hybrid selections tested for bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetida*] reaction during one or more years at 11 co-operating stations in five western [*R.A.M.*, xx, p. 347] States and one in West Virginia are tabulated and discussed. The inoculum was procured either from commercial wheat fields in the vicinity of each nursery or from a composite of collections from fields distributed over the entire Pacific Northwest.

None of the varieties was free from infection at all the stations, though 36 averaged less than 10 per cent. and 7 less than 1 per cent., viz., Hussar × Hohenheimer (10068–1), three lines of Relief × Ridit (11908, 11905, and 11904), two of Oro × Turkey-Florence (11865 and 11864), and Ridit × Hohenheimer (11760). Five resistant varieties, namely, Ridit, Relief, Hussar, Hohenheimer, and Turkey-Florence, were involved in the production of 26 out of 27 of the most promising hybrid selections. In eight of the twelve nurseries the majority of the infected varieties and selections showed less than 10 per cent. bunt. In general, the more virulent races of bunt were fairly prevalent throughout the region of the tests.

In 1940–1 the percentage of carloads of wheat graded as smutty at Pacific Northwest inspection points was only 8·6 compared with 43·7 in 1922–3.

Hirschhorn (Elisa). **Algunos caracteres de las 'Tilletia' spp. que producen las 'caries' del Trigo en la chacra experimental 'La Previsión'.** [Some characters of the *Tilletia* spp. which produce Wheat 'bunts' at the 'La Previsión' experimental farm.]—*Bol. Chacra exp. 'La Previsión'*, iii, 2, pp. 105–109, 1 fig., 1941.

A careful examination of a large quantity of summer wheat bunt (*Tilletia tritici*

and *T. levis*) [*T. caries* and *T. foetida*] material collected in the Barrow district of the Argentine from 1931 to 1940 revealed the existence of a number of hybrid forms or races with distinct morphological characters. To cite some examples, a lot collected in 1931–2 was characterized by very hard, black sori, some containing typical chlamydospores of both species, while others on the same ear were occupied either by densely reticulate or almost entirely smooth ones of variable shape and diameter; in other samples the sori were pale chestnut-coloured and very soft, black and moderately hard, black, hard, and broken, or cinnamon-coloured and very soft, while the chlamydospores were lemon-yellow, chestnut-golden, dark golden, faintly reddish, quasi-hyaline, olive-grey, or yellow-olive, smooth or very faintly reticulate, markedly verrucose, or punctiform. Some 95 per cent. of the chlamydospores, both typical and aberrant, collected in 1939–40 germinated, many producing typical promycelia with basidiospores and secondary sporidia; in other cases the promycelia deviated from the normal in various particulars, e.g., absence of apical basidiospores, pronounced differences in length, malformations, granular protoplasm, ramifications, the formation of one apical and one lateral sporidium, or the development of the typical apical basidiospores, but without clamp-connexions and supplemented by a lateral sporidium, or of a terminal sterigma with no sporidia.

The morphological and physiological heterogeneity arising from this interspecific hybridization greatly complicates the development of bunt-immune wheat varieties, both by reason of the high degree of virulence attainable by such new homo- or heterozygotic races of the fungi concerned, and of the instability of the host reactions to the aberrant forms of the pathogen thus formed.

FORSTER (H. C.) & CROLL (R. D.). **Varietal resistance to foot-rots in Wheat.**—*J. Aust. Inst. agric. Sci.*, vii, 3, pp. 121–123, 1941.

In 1940 wheat at the State Research Farm, Werribee, Victoria, developed exceptionally severe infection by foot rot, due mainly to *Fusarium* spp. Counts of affected heads on four varieties, sown at different times in separate locations gave 20·1, 19·3, 22·4, and 26·1 per cent. infection for Baldmin wheat sown on 10th, 15th, 15th, and 31st May, respectively, the corresponding figures for Sepoy being 24·3, 11·5, 15·1, and 14 per cent., respectively, for Ranee 4H 10·1, 9·3, 17·4, and 4·5 per cent., respectively, and for Ghurka 13·8, 6·7, 9, and 6·6 per cent., respectively. The mean figures for the four varieties in the different situations were 22, 16·2, 10·3, and 9 per cent., respectively, and those for the different locations (all varieties) 17·1, 11·7, 16, and 12·8 per cent., respectively. Statistical examination of these figures demonstrated that the differences produced by variety, location (and/or time of sowing), and the interaction between the two were all significant. Variance for varieties was not only significantly greater than variation within the plant, but was also greater (>1 per cent.) than the variety$\times$location variance. Hence, (a) varietal resistance was demonstrated, (b) different sites and/or sowing dates had a significant effect on the relative order of the varieties, in so far as severity index was concerned, and (c) the average over-all resistance of the varieties was significantly greater than variation due to (b).

Counts for a number of varieties from each of four plots sown on different dates and in different parts of a paddock showed that Baldmin, Free Gallipoli, Quadrat, Sepoy, Pindar, Magnet, Ranee 4H, Ghurka, and Regalia had, respectively, 21, 20, 17, 16, 13, 10, 10, 9, and 8 per cent. infection. Attention is drawn to the fact that late- and early-maturing varieties occur at each end of the list.

It is concluded that varietal resistance was present under the conditions existing, and that, even if varieties with complete resistance cannot be obtained, it should be possible to use the more resistant types to breed wheats that show considerable tolerance.

Zazhurilo (V. K.) & Sitnikova (Mme G. M.). **Diagnosis of virus diseases of cereals.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xxx, 7, pp. 664–666, 1 fig., 1941.

By microscopic investigations on healthy wheat, rye, barley, oats, and other cereals and on similar plants attacked by winter wheat mosaic [*R.A.M.*, xx, p. 522] and pupation disease [ibid., xxi, p. 9], and by a comparison of the results with data on other virus diseases of cereals, it has been possible to give diagnostic anatomical and cytological characters for certain virus diseases. Wheat viruses 1 and 1A of McKinney [ibid., iii, p. 452] give vacuolar bodies but no phloem necrosis or protein crystals. Both vacuolar bodies and phloem necrosis are characteristic of winter wheat mosaic, while pupation disease gives protein crystals in addition. External appearance alone affords no basis for identification. Using this method winter wheat mosaic was identified in samples from Moguilev, Riazan, Orel, Kursk, Voronezh, Saratov, Kuibyshev, Autonomous Soviet Socialist Republic of Volga Germans, Sumy, Kharkov, Zaporozhie, Rostov, and Krasnodar.

Riakhovsky (N. A.) & Fedulaev (A. L.). **Biochemical modifications in the cereals affected with the virus of winter Wheat mosaic.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xxx, 7, pp. 667–668, 1941.

The chief results of an analysis of millet [? *Panicum miliaceum*], oats, and winter wheat attacked by winter wheat mosaic virus [see preceding abstract] and of healthy control plants were that in diseased plants (1) the mono- and disaccharides (and in the case of millet only the combined content of starch and hemicellulose) are greatly increased in amount; (2) the total and protein nitrogen is somewhat lower; and (3) the phosphorus content of the leaves tends to be lower.

Reed (G. M.) & Stanton (T. R.). **Susceptibility of Lee × Victoria Oat selections to loose smut.**—*Phytopathology*, xxxii, 1, pp. 100–102, 1942.

A table is given showing the reactions to a new race of *Ustilago avenae*, collected at Stillwater, Oklahoma, in 1934, and designated A-30, of the Lee and Victoria varieties of oats and 22 selections from crosses between them in inoculation tests at the Brooklyn Botanic Garden in 1941. The parents, Lee and Victoria, contracted, respectively, 92·6 and 43·8 per cent. infection, the incidence of which among the crosses ranged from 6·6 in P34-1-2-1 (C.I. 3400) to 68 per cent. in P34-9-1-1 (C.I. 3406). The new race is of special interest as being pathogenic to the otherwise uniformly resistant Victoria. In further tests three selections from a cross between Victoria and Hairy Culberson showed 52·3 to 70·8 per cent. infection as a result of inoculation with *U. avenae* A-30, to which, on the other hand, the progeny of crosses of Victoria with Fulgrain, Norton, and Nortex, proved resistant; Nortex itself appeared to be resistant as did also Ranger, Rustler, Fultex, Bond, Markton, and Navarro, Black Mesdag, and Red Rustproof [*R.A.M.*, xx, pp. 160, 357, *et passim*].

Murphy (H. C.), Stanton (T. R.), & Coffman (F. A.). **Breeding for disease resistance in Oats.**—*J. Amer. Soc. Agron.*, xxxiv, 1, pp. 72–89, 2 graphs, 1942.

Much of the information presented in this useful tabulated survey of the work in progress in the United States in connexion with breeding disease-resistant varieties of oats has already been noticed from other sources, but the following points may be mentioned. The annual losses from smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]), crown rust (*Puccinia coronata*), and stem rust (*P. graminis avenae*) over the period from 1919 to 1938 are computed in *Plant Dis. Reptr* at 40,000,000, 23,000,000, and 14,000,000 bush., respectively, but recent statistical studies [cf. *R.A.M.*, viii, p. 167; xx, p. 56] on the two rusts indicate that these estimates may be too low.

As regards the smuts, Victoria is highly resistant to all the known races and Markton and Navarro to all but certain rare ones, while Bond and Black Mesdag withstand the

disease adequately under most field conditions. Bond and Victoria are highly resistant to all the important races of *P. coronata*, and the moderate resistance of Rainbow, Alber, and Capa confers considerable protection on the crop in many sections. Richland, Iogold, and Rainbow are highly resistant to all the economically important races of *P. graminis avenae*, and the old White Tartar variety gives a satisfactory performance under certain field conditions; Jostrain (Joanette strain) is only moderately resistant.

By crossing within this group of varieties many new strains have been developed with resistance to one or more of the diseases under discussion. Thus, Marion C.I. 3247, Boone C.I. 3305, Tama C.I. 3502, and Vicland C.I. 3611 are resistant both to the smuts and rusts; Nakota C.I. 2883 (hull-less) and Hancock C.I. 3346 to the smuts and stem rust; and Fultex C.I. 3531, Ranger C.I. 3417, Rustler C.I. 3754, Rangler C.I. 3733, Letoria C.I. 3392, Lelina C.I. 3404, Lenoir C.I. 3393, Levic C.I. 3384, Lega C.I. 3379, De Sota C.I. 3923, Coker-Stanton C.I. 3855, Victorgrain C.I. 3692, and Fulgrain Strain 4 C.I. 3693 to the smuts and crown rust. New smut-resistant varieties include Carleton C.I. 2378, Bannock C.I. 2592, and Marida C.I. 2571.

GRIESBECK. **Zur Frage der Reichweite des Flugbrandes.** [A contribution to the question of the significance of loose smut.]—*Forschungsdienst*, xii, 2, pp. 226–227, 1941.

Loose smuts of barley [*Ustilago nuda*] and wheat [*U. tritici*] are stated to have been on the increase in many parts of Germany of recent years, both in summer and winter crops.

One objection frequently opposed to the systematic treatment of the seed-grain by the laborious hot-water method is that the loose smuts are merely blemishes without effect on the yield, but the writer cannot subscribe to this view. For example, 14 selected summer barley varieties tested in 1940 in the territories newly acquired by the Reich showed 11 to 970 diseased ears per sq. m., an incidence scarcely to be regarded as negligible.

HAENSELER (C. M.). **Helminthosporium leaf spot on Millet in New Jersey.**—*Plant Dis. Reptr*, xxv, 19, p. 486, 1941. [Mimeographed.]

Specimens of German millet (*Setaria italica*) showing severe leaf spot due to *Helminthosporium setariae* [the conidial stage of *Ophiobolus setariae*: *R.A.M.*, x, p. 232] were received from New Jersey in September, 1941. The disease appears to be of infrequent occurrence.

Fungoid diseases of crops and their remedies.—*Mysore agric. Cal., 1941–2*, pp. 38–42, 1941.

Popular notes are given on the incidence and control of a number of fungal diseases of Mysore crops. *Ganoderma lucidum* on areca palm and coco-nut trunks [*R.A.M.*, xiv, p. 693; xv, p. 436] may be combated by the destruction of infected material and fruit bodies of the fungus, prompt isolation of diseased trees, and the application of sulphur dust to the soil at the rate of $\frac{1}{2}$ to 1 lb. per areca palm and 2 to 3 lb. per coco-nut.

BROWN (J. G.). **Wind dissemination of angular leaf spot of Cotton.**—*Phytopathology*, xxxii, 1, pp. 81–90, 2 figs., 1 diag., 1942.

In September, 1940, in southern Arizona, a 240-acre field of the SXP cotton variety, susceptible to black arm (*Phytomonas malvaceara*) [*Xanthomonas malvacearum*], raised from sulphuric acid-delinted and ceresan-dusted seed, contracted extensive and uniform infection by the black arm phase of angular leaf spot [*R.A.M.*, xx, p. 163], adjacent fields being proportionately less severely attacked. The most intensively infected field lay directly west of a half-section of land planted with untreated or 'fuzzy' seed, and adjoined on the west, without barrier, a similarly planted 80-acre

field. A field of cotton raised from treated seed, lying north of the above-mentioned half-section, contained more diseased plants on the side contiguous to the latter, while in a ranch to the south the only infected plants were situated on the side adjoining the half-section. Evidence was available to the effect that the cultivated cotton in the untreated fields constituted the sole source of inoculum, which was apparently conveyed to the treated cotton by a dust storm on 20th August [ibid., xv, p. 215], following injury to the plants by hail a week earlier. The heaviest infection reached the field on the west of the half-section raised from untreated seed, but the inoculum-bearing dust also spread laterally westwards in a fan-shaped belt in such a way as to involve bordering fields on the north and south, while at the same time infective material from the 80-acre field planted with untreated seed was also borne westwards.

Cotton fields serving as controls, situated at a distance of 12 miles from the infested areas and subjected to similar conditions, apart from the hail and dust storms, remained free from black arm.

X. malvacearum was isolated exclusively from untreated seed. The writer's studies were facilitated by absence from the crop of all seed-borne diseases other than black arm, and the virtual freedom of the fields from *Verticillium* [*albo-atrum*] and Texas root rot [*Phymatotrichum omnivorum*]. Part of the damage attributed by farmers to black arm, however, was really due to the air-borne *Alternaria* sp. [ibid., xxi, p. 14].

PRESLEY (J. T.). **Aecidium gossypii, the aecial stage of Puccinia boutelouae.**—*Phytopathology*, xxxii, 1, pp. 97–99, 1942.

Field observations in the late summer and autumn of 1940 in Arizona having indicated the possibility of a connexion between the uredo- and teleutospores of a rust tentatively determined as *Puccinia boutelouae* on the grasses *Bouteloua aristidoides* and *B. barbata* and the aecidia of *Aecidium gossypii* on cotton [*R.A.M.*, v, p. 82], cross-inoculation experiments were carried out in the laboratory at the University of Minnesota in the following spring with positive results on Acala cotton on the one hand and four species of *Bouteloua* (the two above-mentioned, *B. curtipendula*, and *B. gracilis*) on the other. A genetic connexion between the two stages may therefore be regarded as established. The question arises, however, whether *P. boutelouae* is identical with the morphologically very similar *P. vexans*, which are separated by Arthur [ibid., xiii, p. 728] on the basis of teleutospore pedicel length. The writer could find no justification for this distinction, and should further examination reveal the existence of only one species, the name *P. vexans* would take priority over *P. boutelouae*.

MÉTALNIKOV (S.). **Utilisation des microbes dans la lutte contre les insectes nuisibles.** [The utilization of microbes in the campaign against noxious pests.]—*C.R. Acad. Sci., Paris*, ccxiii, 16, pp. 533–535, 1941.

Details are given of further successful experiments in French, Swiss, and Algerian vineyards in the extermination of insect pests by means of treatment of the stocks with a solution of 'sporein' (pulverized spores of bacteria plus an adjuvant and an adhesive) [*R.A.M.*, xvii, p. 35]. This method results in substantial reductions (of the order of 90 per cent. and upwards) of the insect population of the vines, and is regarded by competent authorities in the canton of Geneva as destined to play an important part in viticultural practice.

McCOY (E. E.) & CARVER (C. W.). **A method for obtaining spores of the fungus Beauveria bassiana (Bals.) Vuill. in quantity.**—*J. N.Y. ent. Soc.*, xlix, 2, pp. 205–210, 1 fig., 1941.

A procedure is described for culturing large quantitites of spores of the entomogenous fungus *Beauveria bassiana*, recently shown by E. G. Rex (*J. N.Y. ent. Soc.*, xlviii, pp. 401–403, 1940) to infest adult Japanese beetles (*Popillia japonica*) [*R.A.M.*,

xx, p. 462]. The fungus is grown on autoclaved, moistened wheat bran, on which medium the spore yield is about 22 gm. per lb., the cultures being incubated at a temperature of 72° F. for 10 to 15 days; this is followed by several month's storage without injury. The separation of the spores from the bran may be effected by means of an ordinary flour sifter. For the collection of the spores in bulk an apparatus has been specifically devised in which compressed air under moderate pressure agitates the dried medium in a separatory funnel (of 500 ml. capacity) thereby detaching the spores and suspending them in an air stream turned on by means of a stopcock. This current escapes from the funnel mouth through a glass tube ending in a rubber attachment, and is conducted to a filter consisting of a disk of filter paper clamped between the two opposed rims of two aluminium pie dishes, each 23 cm. in diameter. With a filter area of about 300 sq. cm. about 10 gm. spores may be collected before opening the filter and scraping the paper, which may be used repeatedly.

Cavalcanti (A. P.). **Otomicose.** [Otomycosis.]—*Brasil-méd.*, lv, 43, pp. 726–729, 1941.

The writer briefly surveys the history, symptoms, etiology, and therapy of otomycosis in the light of the relevant literature and of his own experience in hospital and private practice at Botafogo, Brazil, where *Aspergillus niger* [*R.A.M.*, xx, p. 363] was isolated in one of the cases described from the aural canal of a 37-year-old woman.

Gonzalez Ochoa (A.). **Hallazgo del Fonsecaea pedrosoi var. cladosporioides en México.** [Detection of *Fonsecaea pedrosoi* var. *cladosporioides* in Mexico.]—*Rev. Inst. Salubr. Enferm. trop.*, ii, 2, pp. 187–192, 6 figs., 1941. [English summary.]

A cultural study of the fungus isolated by M. Baez from a localized verrucose lesion on the left foot of a Mexican halfbreed and tentatively referred to dermatitis verrucosa (*Rev. Inst. Salubr. Enferm. trop.*, i, 4, pp. 323–338, 1940) revealed its identity with *Fonsecaea pedrosoi* [*R.A.M.*, xix, p. 557] var. *cladosporioides* (syn. *Hormodendrum algeriensis* [ibid., vii, p. 639] and *Phialoconidiophora guggenheimia* [ibid., xvi, p. 812]). This is the first record of the fungus for Mexico [ibid., xx, p. 464].

Briceño-Iragorry (L.). **Nota acêrca de dos casos de tiña endotrix.** [Note on two cases of tinea endothrix.]—*Bol. Lab. clin. 'Luis Razetti'*, i, 3, pp. 65–67, 1 fig., 1941. [Abs. in *Trop. Dis. Bull.*, xxxix, 2, pp. 103–104, 1942.]

Microsporum felineum is stated to have been the parasite associated with tinea tonsurans in Venezuela prior to 1939, in which year, however, Dr. P. Guerra reported 11 cases of fungal infection, four caused by *Trichophyton sabouraudi*, six by varieties of *T. tonsurans* [*R.A.M.*, xvii, p. 819], better known as *T. crateriforme* [ibid., xvii, p. 818], and one by *T. rubrum*, the last-named responsible for Hebra's eczema marginatum.

Cultures on Sabouraud's medium from diverse types of lesions on the scalps of two children treated by the author in private practice in 1940 yielded two types of colony, one large, powdery, with a creamy-yellow centre, whiter towards the periphery, crateriform in the middle with radiating fissures, and the other fluffy and downy, white, and smoother than the foregoing. The powdery colonies gave rise to an abundance of conidia on simple or branched conidiophores, with very rare intercalary chlamydospores, and the smooth ones to fewer conidia, usually borne on simple, lateral or terminal conidiophores, and more chlamydospores. Both are referred to *T. tonsurans*, of which *T. crateriforme* is regarded by Carrión as merely a variant.

Dey (N. C.). **Trichophyton crateriforme in India.**—*Indian med. Gaz.*, lxxvi, 7, pp. 410–411, 1 pl., 1941.

Of 169 cases of ringworm of the scalp investigated at Calcutta, 72 were found to be of the endothrix *Trichophyton* type, 65 associated with *T. violaceum*, and 7 with *T.*

crateriforme [see preceding abstract], of which this is stated to be the first record for India. All the subjects were girls between the ages of 7 and 13 in an Anglo-Indian boarding school. The colonies of the fungus on Sabouraud's proof medium presented the powder-puff appearance described by Sabouraud, a crateriform depression later developing at the centre of the knob-like prominence in the middle, and the white, velvety surface turning brownish or yellowish-brown and powdery, with a hard, cartilaginous consistency. Aleuriospores were the only end-organs observed; they were either simple, sessile or short-stalked, produced laterally or terminally on the growing hyphae, or compound, forming clusters or 'thyrses'. Intercalary chlamydospores were also formed. Sugars were not fermented, there was no proteolysis in Löffler's medium or haemolysis in blood sugar, but the casein in milk was proteolysed. Guinea-pigs, rabbits, and mice reacted positively to inoculation with emulsions of pure cultures, the fungus being reisolated from the resultant typical lesions.

Van Pernis (P. A.), Benson (Miriam E.), & Hollinger (P. H.). **Specific cutaneous reactions with histoplasmosis. Preliminary report of another case.**—*J. Amer. med. Ass.*, cxvii, 6, pp. 436–437, 1941.

Clinical details are given of a fatal case of histoplasmosis in a 63-year-old male patient at St. Luke's Hospital, Chicago, and of the cultural studies on the causal organism, *Histoplasma capsulatum* [*R.A.M.*, xxi, p. 79], which was isolated five months before death from a laryngeal ulcer and grown aerobically on blood (human and rabbit) agar and other media and under semi-anaerobic and anaerobic conditions on blood slants and in broth in two series, one maintained at 37° C. and the other at room temperature. Growth appeared on the plates of the former series in 72 hours and on those of the latter in five days, the colonies on dextrose agar being white and those on blood agar reddish-grey. Reaction to the Gram stain was negative. Round to slightly oval, lateral and terminal, thick-walled chlamydospores, 3·9 to 10 μ in diameter, were formed in six days and were shown to contain fat. A day later, ascus-like bodies developed, closely resembling the chlamydospores except in the presence of small nodules along their outer margins. The fungus did not ferment any of the sugars tested, litmus milk, peptone water (in which indol was produced), or acetyl-methyl carbinol. The organism was recovered from the internal organs of mice and guinea-pigs into which it was injected intraperitoneally in saline suspensions. Broth culture filtrates induced specific immediate and delayed reactions in the patient and in mice.

Schoenkerman (B. B.). **Molds as a cause of seasonal allergy; spore count of Milwaukee.**—*Wis. med. J.*, xl, 9, pp. 797–799, 1 graph, 1941.

Moulds, among which *Alternaria* predominated, were shown by spore counts made from July to October, 1940, to constitute an important factor in atmospheric contamination at Milwaukee, Wisconsin, where a survey was made of the influence of these organisms on the development of allergic symptoms [*R.A.M.*, xxi, p. 16]. The peak number of roughly 190 per 1·8 sq. cm. was reached at the end of August, but as late as 7th October the spores were still present in sufficiently large numbers (60 per 1·8 sq. cm.) to induce severe cutaneous reactions.

Hood (E. G.). **The value of mold and yeast control work.**—*Canad. Dairy Ice Cr. J.*, xx, 4, p. 29, 1941. [Abs. in *J. Dairy Sci.*, xxiv, 12, p. A 357, 1941.]

The principal sources of moulds [including *Oospora lactis*: *R.A.M.*, xxi, p. 79] in Canadian butter are stated to be inefficient pasteurization and raw cream contamination; dead ends in pipes; ineffectually cleaned vats, pumps, pipes, and churns, impure water and dirty holding tanks and ice; incorrectly treated parchment linings; the use of unseasoned timber for butter boxes and their storage in a damp place.

The Storch test is not, by itself, a sufficient indication of thorough pasteurization of cream, and requires to be supplemented by yeast and mould counts, on which

forecasts of the keeping quality of the butter can be based. Pasteurized butter should contain a total of less than 50 moulds and yeasts and 25,000 bacteria per gm. of butter where 'starters' are not used.

JOHNS (C. K.). **Controlling mold growth on Cheddar cheese.**—*Canad. Dairy Ice Cr. J.*, xx, 4, p. 36, 1941. [Abs. in *J. Dairy Sci.*, xxiv, 12, p. A 359, 1941.]

The condition of Cheddar cheese swabbed with 4 and 8 per cent. calcium propionate solutions [*R.A.M.*, xxi, p. 80] at the Central Experimental Farm, Ottawa, though not absolutely mould-free, was immensely superior to that of the untreated control samples, and no contamination developed in the presence of the same compound at a concentration of 12 per cent. Calcium propionate does not actually destroy the moulds but merely inhibits their growth. The immersion of the cheese in disinfectant solutions, though probably a more effective method of treatment, is attended by certain disadvantages.

TIMONIN (M. I.). **Microbial activity as influenced by root excretions.**—*Chron. bot.*, vi, 19–20, p. 440, 1941.

Chemical analyses of modified Crone's nutrient solutions in which flax plants of the Novelty and Bison varieties, susceptible and resistant, respectively, to wilt (*Fusarium*) [*lini*] had been grown for 27 days under aseptic conditions at the Division of Bacteriology, Ottawa, indicated that the former contained only a trace per plant of hydrocyanic acid per 450 ml. compared with 27 to 38 mg. in the latter. After the growth of the resistant Bison, the development of *F. culmorum* and *Helmintho-sporium sativum* was retarded by the solution, whereas that of *Trichoderma viride* was stimulated, the opposite being the case following the culture of the susceptible Novelty. The addition of glucose to the substratum accelerated the growth of all the fungi tested. It is apparent from these data that the minute quantity of hydrocyanic acid excreted or diffused through the root system of the wilt-resistant variety into the surrounding medium diversely influences the activity of the different groups of micro-organisms composing the rhizosphere [*R.A.M.*, xx, p. 29].

WATERHOUSE (W. L.) & WATSON (I. A.). **A note on determinations of physiological specialisation in Flax rust.**—*J. roy. Soc. N.S.W.*, lxxv, pp. 115–117, 1 pl., 1941.

Flax rust (*Melampsora lini*) is stated to cause substantial reductions in the seed harvest under epidemic conditions in Australia, while much lighter infections are responsible for severe damage to crops grown for fibre. In connexion with the breeding of varieties combining suitability for the latter purpose with resistance to rust, tests were carried out on 11 differential varieties with several isolates of the pathogen from diseased samples from New South Wales, Victoria, South Australia, and Tasmania, all of which were found to belong to one physiologic race. Six of the varieties were immune, viz., J.W.S., Abyssinian, Kenya, 'Very pale blue crimped', Ottawa 770 B, and Argentine, three resistant, Buda, Williston Golden, and Williston Brown, one semi-resistant, Akmolinsk, and one susceptible, Bombay. These results show that the race differs from those studied by Flor in North Dakota [*R.A.M.*, xix, p. 655], and confirmatory evidence of this was afforded by Bison C.I. No. 389 and Argentine C.I. No. 705–1, the former uniformly susceptible in the United States and the latter susceptible to all but one of 14 physiologic races, whereas in the authors' trials both these varieties were immune. From this evidence it is concluded that the Australian race of *M. lini* is distinct from any of those previously recorded.

Borax prevents rust of Flax.—*Plant Dis. Reptr*, xxv, 18, p. 459, 1941. [Mimeographed.]

According to a report by H. G. Hegeness, flax grown at the University of Minnesota Farm, planted in May, and treated with 60 lb. borax per acre remained free from rust [*Melampsora lini*: *R.A.M.*, xix, p. 655; xx, p. 294], though untreated plants, and

plants treated with calcium nitrate and zinc sulphate were heavily infected. The borax caused some leaf-burning, and it is thought that applications of 40 or 50 lb. per acre may be equally effective and at the same time harmless.

Baker (K. F.) & Tompkins (C. M.). **A virosis-like injury of Snapdragon caused by feeding of the Peach aphid.**—*Phytopathology*, xxxii, 1, pp. 93–95, 1 fig., 1942.

Antirrhinum majus, *A. speciosum*, *A. nuttallianum*, *A. glandulosum*, *A. virga*, *A. molle*, and *Linaria dalmatica* seedlings and cuttings grown for experimental purposes under glass at Los Angeles, California, were observed in the spring of 1940 to show a virus-like injury of the terminal growth, which was subsequently noted also on outdoor and greenhouse plants in the San Francisco Bay area, and again in 1941 at Los Angeles. The most characteristic symptom consisted of a checking of the apical growth, each leaf rosette, viewed from above, showing a pale yellow to white centre with a green or green- and yellow-mottled periphery. The affected tips often turned brown and died, but in some cases growth was resumed or new lateral branches produced. The leaves were much stunted and often rolled, dorsally curled, and laterally distorted, the apical laminae sometimes bearing yellow or white spots, 1 mm. in diameter, mostly near the veins. In certain double-flowered varieties of *A. majus*, the basal foliage showed persistent, bright yellow, circular spots, up to 5 mm. in diameter.

The injury was found to be due to the feeding on the leaves of the peach aphid (*Myzus persicae*), the removal of which resulted in the production of entirely normal new foliage. Non-viruliferous insects maintained for many generations on turnip induced the same symptoms on *Antirrhinum* as those taken directly from infected plants of the latter. Attempts to transmit a virus from the affected plants to various plants susceptible to this type of disorder were unsuccessful.

Kunkel (L. O.). **Heat cure of Aster yellows in Periwinkles.**—*Amer. J. Bot.*, xxviii, 9, pp. 761–769, 2 figs., 1941.

A preliminary test on the inactivation of the aster yellows virus [*R.A.M.*, xx, pp. 337, 590] in periwinkles (*Vinca rosea*) by heat treatment [cf. ibid., xvi, p. 678] demonstrated that hot-room treatment at 42° C. for one day rendered viruliferous aster leafhoppers [*Macrosteles divisus*] permanently non-infective, presumably freeing them from virus, and indicated that treatments at this temperature for a week or two might cure aster yellows in moderately large periwinkle plants.

To test this view, sets of two plants each were treated for 4, 5, 6, 7, and 14 days. All recovered, and produced apparently normal foliage. Symptoms reappeared after about three months in shoots near the ground in all plants except those treated for 14 days. These last showed no yellows during one year after treatment, and cuttings from them produced plants which remained free from symptoms during seven months' observations. Scions from each of the cured plants grafted on to healthy young periwinkles grew vigorously, and no disease symptoms were observed. An attempt to transmit the disease from the cured plants by means of aster leafhoppers gave negative results, though under the same experimental conditions transmission was obtained from affected asters and periwinkles. Experimental evidence further demonstrated that no attenuated strain of the virus was present in the cured plants.

Further hot-room experiments demonstrated that complete cure (tops and roots) resulted from 14 days' treatment at 38°, while six days' treatment at 36° sufficed to cure small branches. At the latter temperature eight days were required to inactivate all virus in the leafhoppers and 11 days to inactivate it in all the above-ground parts of the plants. Periwinkles could be reinfected and cured as often as desired; there was no evidence that cured plants were more resistant to attack than plants that had never been affected. Hot-water treatments gave the best results at 40°, at which temperature large plants survived for 24 hours, but the method could not be relied upon to

cure the condition in the roots. *Nicotiana rustica* plants affected with aster yellows (roots and top) were cured by hot-room treatment at 40° for three weeks.

Two patterns of recovery short of cure were observed in periwinkles. In one, all virus present in the above-ground parts, but not all that present in the roots, was inactivated. In the other, some virus remained in both tops and roots. The latter type of recovery was slight and transitory, but the favourable effects of the former persisted for many months.

The aster yellows virus would appear to be an entity that cannot exist for long at temperatures frequently reached in summer [in New Jersey]. It is able to spread only in summer and can exist for protracted periods only at rather low temperatures. Its rapid spread under favourable weather conditions shows that it is an efficient parasite. There is good evidence that the virus multiplies in the leafhoppers as well as in the plants, and that, in nature, it passes alternately from the one to the other. The cures obtained by heat inactivation of the virus in periwinkle plants, and its inactivation in leafhoppers show that, in respect of heat resistance, the aster yellows virus reacts independently of its hosts.

Hotson (H. H.). **The morphological distinction between Urocystis gladioli and Papulaspora gladioli.**— *Mycologia*, xxxiv, 1, pp. 52–58, 1 fig., 1 graph, 1942.

From a comparative study of *Urocystis gladioli* (using dried material from collections by G. H. Pethybridge in England, in 1923) and *Papulaspora gladioli* [*R.A.M.*, xx, p. 409] obtained in culture from B. O. Dodge and isolated from diseased gladiolus corms from Long Island, the author concludes that they are two distinct species, the former causing a serious smut of various *Gladiolus* spp. in Europe, but not reported from the United States, while the latter is saprophytic or only slightly parasitic on the same host in the United States. The main distinction consists in the different size of the spore balls, which measure 14 to 23 μ in diameter in *U. gladioli* and 24 to 64 (average 44) μ in *P. gladioli*; furthermore, in *U. gladioli* the single row of thin-walled cells is characteristic of the genus and the definite thickness of the wall of the inner cell is very distinct, whereas in *P. gladioli* the periphery is not always sterile and is more or less indefinite, being often composed of more than one layer of cells, indefinitely and irregularly arranged; finally there are 1 or 2 central cells in *U. gladioli*, while there are usually 2 to 6 or occasionally 6 to 8 in *P. gladioli*. For a diagnosis of *P. gladioli* which is labelled 'sp. nov.' and is not regarded as a synonym of *U. gladioli* (Req.) Smith, reference should be made to B. O. Dodge and T. Laskaris [loc. cit.], but it is pointed out in addition that the average diameter of the bulbils is 44 μ and that the bulbil primordium is a lateral branch, sometimes coiled in one plane, but never a spiral.

Parris (G. K.). **Eye-spot of Napier Grass in Hawaii, caused by Helminthosporium sacchari.**—*Phytopathology*, xxxii, 1, pp. 46–63, 5 figs., 1 graph, 1942.

Severe losses in the Hawaiian Napier grass (*Pennisetum purpureum*) plantings have occurred since the autumn of 1939 as a result of infection by *Helminthosporium sacchari* [*R.A.M.*, xxi, p. 21], sometimes necessitating the ploughing-up of entire stands as useless for fodder and replanting with other grasses. The oval or irregularly coalescent, reddish-brown, yellow-bordered lesions on the leaves measure 1 to 6 by 0·5 to 2 mm., and are very similar to those described by Voorhees [ibid., xvii, p. 754]. 'Runners' or streaks of dead tissue may extend from the primary lesion for several inches towards the leaf apex, causing little damage, while similar formations, unconnected with the fungal spots and accompanied by anthocyanin production, may appear on the foliage of plants with cankered stems, probably as a sequel to vascular disturbance. Old leaves of *P. purpureum* are more intensively attacked than young ones, the growing tip seldom being involved. Acute infection causes withering, desiccation, and premature death of the leaves in acropetal succession, finally leaving the

stem bare except for a tuft of three or four leaves. On the leaf sheaths the lesions are larger, paler, and more diffuse in outline than on the leaves. Lesions may develop on the stems from ground-level to several feet above the soil, but are usually found on the first 6 in., the nodes being more often involved than the internodes; smooth, regular, and reddish-brown at first, they later become sunken, irregular, and bluish-purple or black with greyish-white or reddish-brown margins. The diseased stems are shrunken, pithy, more or less hollow, with a partially or totally decayed interior. The crowns are seldom affected, but occasionally the basal buds are withered and discoloured and their subsequent growth stunted. From a distance, severely diseased Napier grass presents the appearance of having been struck by lightning or burnt by fire.

The taxonomy of the causal organism is fully discussed, and evidence adduced in favour of the retention of the name *H. sacchari* Butler, with its amplified description by Mitra [ibid., x, p. 759], as recommended by McRae [ibid., xiii, p. 12].

The physiological characters of eight isolates of the fungus from *P. purpureum* and one from sugar-cane were compared on various standard media. The Napier grass strain developed most luxuriantly at a temperature of 21° to 28° C. [ibid., v, p. 55 *et passim*]. Little or no difference in the appearance of isolates from the two hosts was observed on certain substrates, whereas on others the cane fungus resembled some Napier isolates but not others. Great variation in the growth of the Napier isolates occurred on certain media. The conidia of this strain were larger at 28° than at 21°, the reverse being the case with that from sugar-cane, except on standard nutrient agar, on which spore dimensions were little affected by changes of temperature.

The inoculation of healthy plants of *P. purpureum* with a strain of the fungus from the same host resulted in the development of typical eye spot symptoms, and the pathogen was reisolated from the diseased material. The Napier grass strain was only mildly injurious to sugar-cane and vice versa.

Eye spot of Napier grass may occur in a severe form at any time of year, unlike the corresponding disease of sugar-cane, which is most virulent during the winter months. Infection is favoured by dry conditions. The substitution of Merker grass, a variety of Napier, is recommended as a control measure.

Cass-Smith (W. P.). **A note on the occurrence of grey mould or Botrytis rot of Apples.** —*J. Dep. Agric. W. Aust.*, Ser. 2, xviii, 3, pp. 217–220, 2 figs., 1941.

At the end of March, 1941, specimens of Jonathan, Yates, Granny Smith, and Rokewood apples from the Mount Barker Co-operative Company were examined and found to be infected by *Botrytis cinerea*, only once previously reported (in 1932) as pathogenic to this host in Western Australia. Inoculation experiments showed the fungus to be mainly a wound parasite (only one successful infection on unwounded fruits), the conclusion likewise reached by G. H. Cunningham in New Zealand [*R.A.M.*, iv, p. 673; xix, p. 644], and the attack under observation was apparently favoured by abnormally heavy precipitation in the middle of March following a protracted drought, similar conditions having prevailed at the time of the earlier record.

Zeller (S. M.) & Evans (A. W.). **Transmission of western X-disease and marginal leaf spot of Peach in Oregon.**—*Plant Dis. Reptr*, xxv, 18, pp. 452–453, 1941. [Mimeographed.]

In transmission studies on 'X' disease of peaches [*R.A.M.*, xxi, p. 147], first recognized in eastern Oregon in 1939, but present in some parts of the State some years before, 31 peach seedlings grown from Lovell peach pits were budded with buds from diseased trees in eastern Oregon. The following spring 14 seedling trees were affected, and of these several were dead by August. Thirteen showed symptoms resembling those seen under field conditions, including longitudinal leaf roll and purplish-bordered areas which fell out. All 14 turned yellow early, and one showed flat, chlorotic leaves without leaf roll or purplish areas. As diseased buds from Oregon when budded into

seedlings in New York produced only this flat, yellow symptom, two distinct strains of the virus would appear to be present in Oregon. Some buds from affected bud sticks gave healthy growth when budded into seedlings.

Lovell seedlings budded with Rochester peach showing marginal leaf spot produced leaves which remained characteristically green, but had a few to many brownish or reddish, circular spots, particularly along the margins. In the Columbia River basin, eastern Oregon, these symptoms appear in June and during the rest of the season become progressively more severe. The spots drop out, leaving a ragged margin, and the leaves fall early. If any fruits develop, they ripen late and have hard, sound pits. There is no doubt that this is the condition described as 'group 3' by E. L. Reeves and L. M. Hutchins (Observations in the new so-called virus diseases of Peach trees. *Proc. 36th ann. Meet. Wash. St. hort. Ass.* [no date]). The marginal leaf spot symptoms were well developed 11 months after inoculation in both Lovell seedlings and Rochester trees.

When buds from red-leaved chokecherry [*Prunus* sp.], supposedly infected with the western type of X disease, were grafted into seedling peach, none of the chokecherry buds lived, but in six cases organic union was established between the chokecherry and peach tissues. In these six cases disease was transmitted, but the symptoms resembled those of marginal leaf spot. In the inoculated trees the spots took the form of circular, yellowish areas about 2 mm. in diameter, which turned purplish-red, and then became necrotic brown and dropped out, leaving a shot-hole effect along the margins. The central portions of the leaves remained dark green until late in the season. Further work is in progress to ascertain the relation of this marginal leaf spot to X disease.

HAHN (G. G.). **Field tests with a staminate clone of Alpine Currant immune from blister rust under greenhouse conditions.**—*Plant Dis. Reptr*, xxv, 19, pp. 476–478, 1941.

In the summer of 1940 plants of the staminate clone of Alpine currant (*Ribes alpinum*) previously found to be immune from *Cronartium ribicola* under greenhouse conditions [*R.A.M.*, xix, p. 158] were planted in the field in north-eastern Connecticut, together with plants of a susceptible pistillate clone, and the susceptible prickly gooseberry (*Ribes cynosbati*), the last-named being used to provide an indication of the presence of natural inoculum. One Alpine plant of each sex, together with one prickly gooseberry, was planted in dense shade on the bank of a stream, while two specimens of the pistillate clone and three of the staminate were planted with the prickly gooseberry in a cultivated vegetable garden fully exposed to the prevailing winds.

The four staminate plants of the clone previously reported as immune resisted infection, i.e., fertile fruiting bodies did not develop, and no necrotic foliar flecks [loc. cit.] were observed. The three pistillate plants all became infected. The plant growing in the shade produced small leaves of thin texture; under 10 per cent. of the total leaf surface was colonized by the rust. By August mostly teleutosori were found, which were snuff-brown, and longer and narrower than those produced on leaves in the open. Similarly, less necrosis of infected leaf occurred in association with teleutosori formation. The pistillate plants in the open were exceptionally robust, but about 50 per cent. of the total leaf surface showed infection. By August teleutosori were more numerous than on the pistillate plant of the same clone growing in the shade, and were shorter, broader, and walnut-brown. Old infection areas on leaves growing in full sunlight became necrotic.

The prickly gooseberry plants became infected in the shade and in the open, infection on the former site being less than on the latter.

These results confirm the earlier greenhouse tests in demonstrating that these pistillate plants of *R. alpinum* were susceptible to *C. ribicola* while the staminate ones were immune.

Hyde (W. C.). **Preservation of calico and hessian cloth when exposed to the weather.**—*N.Z. J. Agric.*, lxiii, 6, p. 504, 1941.

Satisfactory control of fungal deterioration in tent calico, chiefly due to *Cladosporium herbarum*, was obtained in co-operative experiments, organized by the Public Works Department and Plant Research Bureau, in the Waipoua Forest, Wellington, New Zealand, by one hour's immersion in shirlan WS, used at the rate of 1½ oz. per gal. water [*R.A.M.*, xvii, p. 524], which prevented the development of all but a trace of black spot at the end of a year's exposure to very exacting conditions involving heavy infection of the untreated controls in three or four months. The cost of the treatment ranged from 4*s.* to 9*s.* 6*d.* per tent, compared with 19*s.* 6*d.* for the other two effective preparations, iron chromium Nos. 1 and 2, which imparted brown and green tints, respectively, to the calico, interfering (especially the former) with light transmission.

Jute and cotton sandbags may be adequately protected against decay [cf. ibid., xxi, p. 214] and their service lives extended eightfold by immersion up to saturation point in 40 gals. Burgundy mixture (11½ lb. washing soda dissolved in 5 gals. water and stirred into a solution of 10 lb. copper sulphate in 30 gals. water), the cost of which does not exceed 0·1*d.* per bag.

Altergot (W. F.), Lavyghina (Mme K. S.), & Kuvshinova (Mme O. P.). **Destructive changes of the protoplasm in the course of lysis in the species Fusarium.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xxxi, 3, pp. 286–289, 1 fig., 1941.

A microchemical study of lytic and non-lytic strains of several species of *Fusarium* (*F. niveum*, *F. lini*, *F. graminearum* [*Gibberella saubinetii*], and *F. solani*) conducted at the Saratov University, U.S.S.R., revealed a gradual disintegration of the cell nuclei of the fungi during the process of lysis, leading to a complete dissolution of the nuclear material in the protoplasm. This is accompanied by the disappearance of volutin granules and the accumulation of lipoid substances in the protoplasm of the cells of the fungi. It is suggested that the lytic factor, which accumulates during lysis and by its biological action approaches the group of bios substances, is also connected with compound protoplasmic complexes, and is liberated in their decomposition.

Brodie (H. J.) & Neufeld (C. C.). **The development and structure of the conidia of Erysiphe polygoni DC. and their germination at low humidity.**—*Canad. J. Res.*, Sect. C, xx, 1, pp. 41–61, 5 figs., 1942.

Following up the work of Yarwood [*R.A.M.*, xvi, p. 104] and of the senior author (1937, unpublished), germination studies with *Erysiphe polygoni* from knotweed (*Polygonum aviculare*) were conducted during 1939 and 1940 at the University of Manitoba, Canada, and the conidia of the fungus again found capable of germination, unlike other fungi, throughout a range of relative humidity from approximately zero to 100 per cent. The conidium of *E. polygoni* becomes cut off from the conidiophore by the deposition of a ring of wall material internally until a perforate disk is formed. Later the pore is closed and the mature conidium remains attached to its conidiophore by a papilla, until detached by shock, wind, or some other mechanical means. The conidia have never been observed to germinate *in situ*. The wall of the mature conidium appears to be relatively impervious to water and probably to gases except at the papillate end, through which stain has been shown to enter. The conidium is thus almost sealed against the ingress of oxygen from the outside and release of carbon dioxide from the inside, without which the germination process cannot take place. As an explanation of the mechanism of germination it is suggested that when the conidium is dislodged from its conidiophore, the end of the papilla becomes exposed to the surrounding air and, being more permeable than the remainder of the conidial wall, it allows carbon dioxide to pass out and oxygen to pass in, causing respiration and

other germination processes to begin. This suggestion was borne out by the results of experiments in which germination was checked in freshly detached conidia when they were held in an atmosphere containing 10 per cent. carbon dioxide, the same conidia germinating normally when removed from the carbon dioxide. Germination was similarly checked by holding the conidia in an atmosphere of nitrogen. The increase in volume that would seem necessarily to arise from the production of a germ-tube may conceivably result from the viscid protoplast being converted into materials more labile and voluminous, without the uptake of water being involved at all. Contrary to Yarwood's findings, the authors observed no shrinkage of the conidia during germination, but shrivelling and collapse took place when death was imminent. Quite regularly many conidia shrivel early in germination tests and it is thought that in such conidia the papilla does not function normally.

During the course of the experiments it was found that ordinary rubber tubing and rubber stoppers are extremely toxic to conidia of *E. polygoni*. Vulcanized rubber reduced germination from 41 per cent. in the control to 3·5 per cent., while non-vulcanized rubber reduced it from 57 to 37 per cent. In a further experiment as little as 0·01 gm. of vulcanized rubber per 100 c.cm. air was found to prevent mildew spores from germinating on dry slides in Petri dishes. It would appear that some compound of sulphur present in vulcanized rubber is responsible for its toxicity.

Dykstra (T. P.). **Potato diseases and their control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1881, 65 pp., 50 figs., 1941.

This useful bulletin gives popular descriptions of potato diseases with a key for their identification, and discusses control measures, the development of disease-resistant varieties, storage, and seed certification. The losses due to potato diseases in the United States for the year 1938 are stated to have been estimated at one-sixth of the entire crop, representing a value of $35,000,000.

Kramer (M.). **A 'perna preta' da Batatinha.** [Potato black leg.]—*Biológico*, vii, 12, pp. 350–353, 3 figs., 1941.

A popular account is given of the symptoms of potato black leg (*Erwinia phytophthora*), which has been reported from various parts of São Paulo, Brazil [*R.A.M.*, xvii, p. 57], and of the environmental factors affecting its development. Control measures should include storage of the tubers destined for planting in a dry, cool place; 1½ hours' immersion of the seed in 1 in 1,000 mercuric chloride; repeated inspections of the plots, especially those intended for the yield of seed, removing promptly all infected plants and setting aside any tubers fit for consumption, the diseased ones to be burnt; selection of elevated, well-drained sites for planting; quadrennial or quinquennial crop rotation, avoiding the alternation of potatoes with cucumber, tomato, broad bean, carrot, or radish, all of which have served as artificial hosts of the pathogen in inoculation experiments [ibid., xiii, p. 100]; and the use of thoroughly sound, certificated seed.

Snell (K.). **New blight-resistant Potato varieties.**—*Int. Bull. Pl. Prot.*, xv, 11, p. 201M, 1941.

Three of the five new potato varieties, viz., Erika, Frühnudel, and Robusta, recently authorized for cultivation in Germany, are resistant to all physiologic races of potato blight (*Phytophthora infestans*), including the widespread biotype A [*R.A.M.*, xxi, p. 218]. Frühnudel is a yellow cooking variety, while the other two, with their high starch content, are suitable for industrial purposes. The varieties in question were derived from crosses between cultivated sorts and the 'W' forms of South American origin imported by the Biological Institute in 1912 and continuously improved since that date. In addition to resistance to late blight the primitive forms have conferred on the cultivated European varieties certain genes hitherto absent from the latter and

resulting in the production of heavy yields. With the development of the new varieties a problem occupying the attention of plant-breeders for nearly a century has in a large measure been solved.

Tucker (J.). **Observations on Potato problems in the United States.**—*Amer. Potato J.*, xix, 1, pp. 1–6, 1942.

Among the problems confronting American potato-growers at the present time are those relating to tuber-indexing for the improvement and maintenance of quality in seed stocks, and the control of bacterial ring rot [*Bacterium sepedonicum*: *R.A.M.*, xxi, p. 95], which is stated to have spread far and wide throughout the country of recent years. A combination of the smear and ultra-violet light methods for the diagnosis of infection appears to be giving speedy and effective results in the hands of experienced operators.

The losses due to decay-producing organisms entering the tubers through injuries inflicted during washing and brushing, practices which are becoming more general, have been extremely small, but it is agreed that treated lots should be promptly marketed and consumed, and not held for storage purposes.

Brentzel (W. E.). **Treatment removes Rhizoctonia from Potato tubers.**—*Amer. Potato J.*, xix, 1, pp. 16–17, 1942.

The washing of potato tubers in preparation for the market [see preceding abstract] has created new problems in connexion with the spread of diseases, e.g., bacterial ring rot [*Bacterium sepedonicum*] and certain storage rots by means of the water. While testing a number of disinfectants for the prevention of this trouble, it was observed that the sclerotia of *Rhizoctonia* [*Corticium solani*] on tubers left in a solution of calcium hypochlorite for several hours were so extensively disintegrated as to be readily detachable by light brushing in water. At the same time, the outer rough surface of the tubers was slightly oxidized and bleached, the resultant fresh, pinkish colour resembling that of new potatoes. Good results were also obtained by immersion for 15 hours in a cold 5 per cent. solution of chlorinated lime, followed by light brushing, while in other tests satisfactory control was effected by six hours in a 10 per cent. solution and by one hour at a concentration of 5 per cent. at 100° F.

Elmer (O. H.). **Sterilization of Rhizoctonia sclerotia with corrosive sublimate.**—Abs. in *Phytopathology*, xxxii, 1, p. 3, 1942.

A momentary dip of seed potatoes infected by *Rhizoctonia* [*Corticium solani*] in acidulated mercuric chloride (3 in 500) was found to sterilize the adhering sclerotia more thoroughly than a ten-minute treatment in a 1 in 500 solution, the number of disease-free sprouts in 15 comparative tests since 1936 being 74·7 per cent. for the former and 64·2 per cent. for the latter method, the controls yielding only 7·3 per cent. healthy sprouts. The frequence of soil-borne infection by *C. solani* did not exceed 3·8 per cent. The death of the sclerotia resulting from momentary or ten-minute immersion evidently occurs after planting and not during the treatment. When sclerotia-covered tubers, after treatment by the momentary or ten-minute dips, were dried and cut in half, the half-tubers, held for 14 hours under running water to remove adhering mercuric chloride, developed sprouts with 89·1 and 91 per cent. infection, respectively, compared with only 28 and 41·5 per cent., respectively, for the unwashed halves. Effective control evidently necessitates a sufficient dosage of the chemical on the planted tubers, either applied momentarily at high concentrations or for a longer period at lower ones.

Younkin (S. G.). **Weed suscepts of the Potato yellow dwarf virus.**—*Amer. Potato J.*, xix, 1, pp. 6–11, 1942.

Seedlings of 15 weeds exposed to infestation by the clover leafhopper (*Aceratagallia sanguinolenta*), the vector of the yellow dwarf virus of potato [*R.A.M.*, xx, p. 36],

under controlled conditions at Cornell University, Ithaca, New York, contracted the typical symptoms of the disease, including vein-clearing of the youngest leaves, followed by distortion, stiffening, and thickening, and failure of the petioles to elongate normally, so that a rosette of stunted foliage was formed round the crown of the plant. Later the affected leaves expanded, the petioles elongated to some extent, the veins turned pale green, and the leaves assumed an erect position, while the only sign of the disease in the foliage subsequently produced was its dark green coloration and upright habit. These symptoms were most pronounced in *Chrysanthemum leucanthemum* var. *pinnatifidum*, but similar features characterized the reactions of the following: *Tragopogon pratensis* (which was killed), *Rudbeckia hirta*, *Anthemis cotula*, *Galinsoga ciliata*, *Lepidium campestre*, *L. virginicum*, *Brassica nigra*, *Sisymbrium altissimum*, *Erysimum cheiranthoides*, *Verbascum thapsus* (still showing marked signs of yellow dwarf eight months after inoculation), *V. blattaria*, *Rumex crispus*, *R. obtusifolius*, and *Leonurus cardiaca*.

The presence of the virus was demonstrated in naturally diseased plants of *C. leucanthemum* var. *pinnatifidum*, red clover (*Trifolium pratense*), *Rudbeckia hirta*, and *Barbarea vulgaris*, and limited experimental evidence is presented indicating that the first-named may serve as a more important source of infection in the field than medium red clover (*T. medium*). Thus, the virus was transmitted from spontaneously infected *C. leucanthemum* var. *pinnatifidum* from a farm in Steuben County, New York, to 40 out of 48 *Nicotiana rustica* plants (83·3 per cent.), scions from which were grafted on healthy Green Mountain potatoes; six weeks later the latter showed typical yellow dwarf symptoms. Counts in three fields revealed 14·1, 30·6, and 27·7 per cent. infection, respectively, among the chrysanthemum population of each of 50 plots 1 sq. ft. in extent, while in the greenhouse (where the symptoms tend to disappear), 67·2 per cent. of the plants removed from an area of 4 sq. ft. in one of the fields gave a positive yellow dwarf reaction on *N. rustica*. Out of 627 red clover plants tested on the same host, only one was positive for the virus, and further tests likewise indicated the relative unimportance of this plant as a reservoir of infection.

Hansing (E. D.). **New suscepts of the yellow dwarf virus.**—Abs. in *Phytopathology*, xxxii, 1, p. 7, 1942.

The following plants, representing three different families, were found to harbour the potato yellow dwarf virus [see preceding and next abstracts] in New York State: *Kalanchoë daigremontiana*, *Barbarea vulgaris*, *Capsella bursa-pastoris*, and *Medicago lupulina*, the first-named being an exotic from Madagascar and the others fairly common native weeds. The Mammoth Red variety of red clover (*Trifolium pratense*) and the English and Kent Wild Whites (*T. repens*) have also been found to be susceptible.

Hansing (E. D.). **A study of the control of the yellow dwarf disease of Potatoes.**—Abs. in *Phytopathology*, xxxii, 1, p. 7, 1942.

In New York State the best control of potato yellow dwarf [see preceding abstracts] is secured by the use of varieties escaping the disease under conditions promoting moderate to extensive spread in the field, e.g., Arran Banner, Chippewa, Golden, Houma, Jubel, Katahdin, Sebago, and Warba, all of which contracted under 2 per cent. infection in replicated tests, compared with 2 to 11, 3 to 29, and 6 to 53 for Russet Burbank, Rural, and Green Mountain, respectively. The percentages of infection for 20 U.S.D.A. seedling varieties ranged from 0 to 72. Some reduction in the incidence of yellow dwarf was effected by attention to certain cultural factors, such as the location of the potato field, date of planting, the use of shielding crops, the roguing of current-season diseased plants, early harvesting, and the selection of seed potatoes from the middle of the field, as well as by dusting or spraying with pyrethrum, celite, sulphur, or Bordeaux mixture.

Clinch (Phyllis E. M.). **A strain of the tuber blotch virus causing top necrosis in Potato.**—*Sci. Proc. R. Dublin Soc.*, xxii, N.S., 46, pp. 435–445, 1 pl., 1941.

In further work at Glasnevin a second separation of the potato tuber blotch virus or virus F [*R.A.M.*, xvii, p. 832; xix, p. 162] from the X component was made by passage of interveinal mosaic through Arran Crest potato (which reacted with top necrosis). Core grafts of the necrotic Arran Crest tubers to healthy President yielded what appeared to be typical tuber blotch in that variety. Introduced to Irish Chieftain, however, the virus differed from that originally isolated by producing a lethal top necrosis. The units of the stock cultures of interveinal mosaic in President, from which the two isolations had been made, showed a corresponding difference in Irish Chieftain, though apparently identical in President. In the present paper the supposed complex is referred to as 'virulent tuber blotch', true tuber blotch being caused by virus F.

When virulent tuber blotch was introduced into different potato varieties by grafting, two main reactions occurred, a fatal top necrosis, and a slight yellow spotting at the distal end of the lower leaves. In all those varieties that showed the second type (14 out of 32), the effects were identical with those of virus F.

Virulent tuber blotch was readily transmitted by inoculation to *Capsicum annuum*, *Solanum nodiflorum*, *Nicotiana glutinosa*, *S. nigrum*, *Datura stramonium*, Kondine Red tomato, Rosy Morn petunia, and White Burley and Yellow Orinoco tobacco, the reactions produced being identical with those caused by virus F.

A study of the physical properties showed that no infections were obtained with sap from affected plants at temperatures over 62° C., that when crude sap, cleared by passing through compressed paper pulp, was filtered through L1, L3, and L5 Pasteur-Chamberland candles, some infection was obtained from the L1 line only, that crude sap stored at 16° to 18° became non-infective after three to four days, and that when crude sap was diluted with distilled water a dilution of 1 in 200 was the limit for infectivity. The physical properties of virulent tuber blotch virus were thus similar to those of virus F.

Other evidence demonstrated that the top necrosis element in virulent tuber blotch was unrelated to potato viruses B, C, or D, which also cause top necrosis. Thus, virus B passed freely through L3 and L5 filter candles, while the virus of virulent tuber blotch failed to do so. Virus B survived heating at 67°, while virulent tuber blotch virus was destroyed at temperatures over 60°. After five days at 20° a mixture of virulent tuber blotch sap and virus B sap caused 100 per cent. infection with virus B, while the virulent tuber blotch virus was destroyed. Virus B also failed to afford 'protection' against virulent tuber blotch in Up-to-Date potato plants. Virus C differs from virulent tuber blotch virus in that it produces top necrosis in President and Arran Banner potatoes, is not sap-transmissible, and appears to be restricted in its host range to potatoes. Virus D has been established as a strain of virus X, which differs fundamentally from virulent tuber blotch.

In insect transmission studies *Myzus persicae* failed to transmit any virus from President potatoes infected with virulent tuber blotch alone. In the presence of virus A, virulent tuber blotch, as such, was transmitted once.

Potato plants infected with virus F were immune from virulent tuber blotch. Virus G (aucuba mosaic) and virulent tuber blotch were also mutually protective.

It is concluded that virulent tuber blotch is caused by a strain of virus F, from which it arose spontaneously within the tissues of a potato plant. By its recognition Koch and Johnson's 'potato streak' virus [ibid., xiv, p. 525] is identified.

Granovsky (A. A.) & Peterson (A. M.). **Soil fauna in relation to the pit scab of Potatoes.**—Abs. in *Phytopathology*, xxxii, 1, pp. 6–7, 1942.

Studies of the relationship between soil microfauna and potato scab (*Actinomyces scabies*) [*R.A.M.*, xvii, p. 739] indicate that about half the fungal pits are free from

animal life, the remainder being infested by mites (viz., *Rhizoglyphus hyacinthi*, *R. phylloxerae*, and species of *Macrochelus*, *Cheyletus*, and Uropodidae, most of which are scavengers or of a predaceous habit), Annelid worms, and nematodes: *Pnyxia scabiei*, believed in some parts of the United States to be responsible for the disease, was detected in one sample only. The few maggots of Mycetophilidae observed in the pits belonged to *Sciara pauciseta*, *S. nitidicollis*, and species closely related to *Forcipomyia pilosa*. Several species of Sminthuridae, Isotomidae, and Entomobryidae were of fairly frequent occurrence. Scab is defined as resulting from the interaction of a physiologic race of *A. scabies* [ibid., xix, p. 725], secondary bacterial decay, and mycetophagous soil microfauna.

Bortels (H.). **Die Bedeutung der Spurenelemente für Entstehung und Verhütung von Pflanzenkrankheiten.** [The significance of the trace elements in the origin and prevention of plant diseases.]—*NachrBl. dtsch. PflSchDienst*, xxi, pp. 69–72, 1941. [Abs. in *Chem. Zbl.*, cxiii (i), 4, p. 500, 1942.]

Reclamation disease [of cereals, chiefly oats, and other crops] is induced by a shortage of copper in the soil [*R.A.M.*, xxi, p. 134]. So far, Europe is free from zinc deficiency diseases. Heart and dry rot of sugar beets and 'glassiness' of fodder beets [ibid., xviii, p. 428] are stated to be curable by the application of molybdenum to the soil, and a scarcity of this element may be responsible for certain forms of legume 'sickness'. Cobalt and germanium are reputed to heal crown gall tumours [*Bacterium tumefaciens*], while resistance to mildews [Erysiphaceae] is enhanced by silicic acid [ibid., xix, p. 489]. On the other hand, certain disorders are attributable to an excess of chromium, arsenic, and selenium.

Abbott (E. V.) & Ingram (J. W.). **Transmission of chlorotic streak of Sugar Cane by the leaf hopper Draeculacephala portola.**—*Phytopathology*, xxxii, 1, pp. 99–100, 1942.

Particulars are given of experiments at the Bureau of Plant Quarantine, United States Department of Agriculture, Houma, Louisiana, in which 490 healthy C.P. 29/320 sugar-cane plants (grown under cages in pots of steamed soil from cuttings immersed for 20 minutes in water at 52° C.) were exposed to infestation by the leafhopper *Draeculacephala portola* Ball from March to late May, 1941, allowing an average of five insects to feed on each plant. By 1st September 25 of the plants thus treated had developed the typical symptoms of chlorotic streak [*R.A.M.*, xx, p. 276], 20 being in cages containing both healthy and diseased plants and the remainder in those from which the infected plants had previously been removed. None of the controls, grown in proximity to diseased plants, but without the possibility of leafhopper intervention, contracted chlorotic streak. The results of these tests, though admittedly preliminary, are considered to afford evidence of the implication of *D. portola* in the transmission of the disease. The insect in question is stated to be the most abundant of all those attacking sugar-cane in Louisiana, with the exception of mealy bugs.

Pinto (M. C. de R.). **V contribuicão para a flora criptogamica do norte de Portugal** [Contribution V to the cryptogamic flora of the north of Portugal.]—*Brotéria*, x, 4, pp. 161–167, 1941.

In this annotated list of 34 species of fungi collected in the north of Portugal are included *Stereum purpureum* on quince, *Merulius lacrymans* and *Paxillus acheruntius* on timber, *Phragmidium violaceum* in the uredo- and teleutospore stages on *Rubus* sp., *Venturia pirina* on pear, *Sphaerotheca pannosa* (in its conidial stage, *Oidium leucoconium*) on rose, and *O. quercinum* var. *gemmiparum* on oak.

SPARROW (F. K.) Jr. **A classification of aquatic Phycomycetes.**—*Mycologia*, xxxiv, 1, pp. 113–116, 1942.

This is an outline of a classification of the aquatic Phycomycetes based primarily on the structure of the zoospore and arranged in two series, (*a*) uniflagellate (consisting of the orders Chytridiales, Blastocladiales, and Monoblepharidales, which are believed to be closely related to each other) and (*b*) biflagellate (comprising the Plasmodiophorales, Saprolegniales, Leptomitales, Lagenidiales (formerly Ancylistales), and Peronosporales). In a footnote it is stated that Professor J. N. Crouch has suggested dividing the biflagellates into those with flagella of very unequal length (Plasmodiophorales) and those with equal or nearly equal flagella.

MIX (A. J.). **Errata in two recent papers on Taphrina.**—*Kans. Univ. Sci. Bull.*, xxvi, 6, pp. 355–356, 1939. [Received February, 1942.]

Errors and omissions in the author's two recent papers on the genus *Taphrina* [*R.A.M.*, xvii, p. 841] are given.

LOHWAG (K.). **Zur Anatomie des Deckgeflechtes der Polyporaceen.** [A contribution to the anatomy of the protective tissue of the Polyporaceae.]—*Ann. mycol., Berl.*, xxxviii, 5–6, pp. 401–452, 38 figs., 1940.

Detailed descriptions are given of the anatomy of the protective tissue of a number of Polyporaceae, including some responsible for the rotting of conifers and hardwoods in the Ostmark (Austria), e.g., *Ganoderma lucidum*, *G. applanatum*, *Fomes pinicola*, *Ungulina annosa* [*F. annosus*], *U. betulina* [*Polyporus betulinus*], *U. quercina* [*P. quercinus*], *Phellinus* [*F.*] *igniarius*, *F. robustus*, of which *P.* [*F.*] *hartigii* is regarded as a variant [*R.A.M.*, xvii, p. 358], *Xanthochrous* [*Polyporus*] *hispidus*, *Phaeolus* [*Polyporus*] *schweinitzii*, *Trametes cinnabarina*, *T. suaveolens*, *T.* [*Lenzites*] *trabea*, *T.* [*L.*] *gibbosa* [ibid., xviii, p. 719], *Daedalea quercina*, *L. betulina*, *Coriolus* [*Polystictus*] *versicolor*, *C.* [*D.*] *unicolor*, *C.* [*F.*] *connatus*, *C.* [*P.*] *hirsutus*, *Leptoporus* [*Polyporus*] *imberbis*, and *L.* [*P.*] *adustus*.

VOROBIEVA (Mme M. N.). **Proteolytic activity of a preparation from Tobacco mosaic virus.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xxx, 5, pp. 466–467, 1941.

The results are given of an investigation on the effect of tobacco mosaic virus protein on seven-day-old tomato seedlings thoroughly ground up in a mortar and the destruction of the normal proteolytic enzymes then effected by boiling. By the addition to such preparations of tobacco mosaic protein (obtained by the method of Ryjkoff and Gromyko [*R.A.M.*, xvii, p. 708]) together with toluol as an antiseptic and following incubation at 32° C. for 106 hours, hydrolysis of protein took place, the degree of hydrolysis being greater when 0·31 per cent. potassium cyanide was present. It is suggested that this hydrolysis was effected by the virus protein itself or that there had been adsorption of proteolytic enzymes on the surface of the virus protein used.

MCKINNEY (H. H.). **Virus-antagonism tests and their limitations for establishing relationship between mutants, and non-relationship between distinct viruses.**—*Amer. J. Bot.*, xxviii, 9, pp. 770–778, 1941.

In virus antagonism studies [a preliminary account of which has been noticed in *R.A.M.*, xix, p. 556] tests were made with systemic against systemic viruses, in which young Wisconsin Havana Seed tobacco plants were inoculated with *Nicotiana* virus 1 (James Johnson's source), and then inoculated again, when mosaic symptoms had appeared, with a strain descended from the same virus.

The results showed that *N.* virus 1 rapidly and completely dominated all its primary and secondary mutants. Complete virus domination among the mutants occurred

quickly only among those that descended in direct line. Domination was slow to very slow when the mutants were selected from different lines of descent. The indication was that mutants from different lines of descent from a given virus may be found which differ in their ability to affect chlorophyll balance, but which are entirely compatible in a suitable host. Hosts may possibly be found in which a given virus may suppress an unrelated virus. The dominating virus was not in all cases that one of a pair which induced the weaker symptoms.

In tests on systemic viruses considered to be unrelated *N.* virus 1 and its mutant BSY were each combined with mosaic viruses of cucumber, celery, and potato, and *N.* virus 6. The data showed that symptoms alone cannot be used as a criterion for virus domination. The proof of virus domination evidently rests with suitable inoculation tests to determine the presence or absence of the virus that does not induce symptoms.

Studies were also made with hosts developing local, necrotic lesions when inoculated with certain viruses. When plants, with not fewer than seven leaves, of Maryland Medium Broadleaf tobacco and *N. sylvestris* showed typical mosaic the leaves were inoculated by wiping the upper surfaces with *N.* virus 6 or BSY (which induce lesions on these hosts). The results demonstrated that the virus-antagonism reaction is quantitative, i.e., it may be partial or complete, depending on the viruses, the nature of the test plant, the environment, and the method used. Strictly speaking, complete domination of one virus over another did not occur with the necrotic-lesion method, even in *N. sylvestris*. In a repeat experiment inoculation with a ring-spot virus [ibid., xix, p. 557] delayed the appearance of lesions by a yellow mosaic mutant, but the number was not reduced. Repeated tests with mosaic virus combinations have shown a reduction in number and a delayed appearance of the lesions. The data strongly suggested that virus antagonism involves many factors essentially similar to those obtaining in the phenomenon of aversion in fungi and bacteria. One virus may induce by-products antagonistic to another virus, or may make more efficient use of the virus-building materials supplied by the plant.

N. virus 6 and *N.* virus 1 should, it is claimed, be designated by separate numbers, as there is no evidence that either mutated from the other. *N.* virus 6 does not infect the tomato genotypes tested, and has a lower thermal inactivation point and smaller paracrystals than *N.* virus 1. For the present, *N.* virus 6 is regarded as ranking closer to *N.* virus 1 than to the other mosaic viruses studied.

From the results of this work with the virus-domination reaction and in view of the questionable status of the serological reaction, it appears that both reactions fail to meet the requirements necessary for proving natural relationships and non-relationships between the plant viruses on a comprehensive scale. Both reactions appear limited in their application to certain viruses and virus strains; and, with these, other reactions appear to be equally satisfactory for indicating natural relationships, and more satisfactory for establishing non-relationships. Both reactions, however, may serve to differentiate and identify viruses, without regard to virus genetics and phylogeny.

Braun (A. C.) & Elrod (R. P.). **Pseudomonas aeruginosa : plant pathogen.**—Abs. in *J. Bact.*, xliii, 1, pp. 40–41, 1942.

Five cultures of *Pseudomonas aeruginosa* obtained from human or animal sources produced severe leaf spot and necrosis of tobacco inoculated either by needle punctures or spraying, while destruction of the surrounding tissues, often accompanied by extensive wet rot, followed needle puncture inoculations into the stem. Koch's postulates were uniformly fulfilled in connexion with these tests. It is believed that several green-fluorescent bacteria which have been described as causing diseases of plants [e.g., tobacco wildfire: cf. *R.A.M.*, xix, p. 48] are identical with *P. aeruginosa.*

Walker (E. A.) & Wise (S. E.). **Anthracnose disease in Maryland Tobacco beds.**—*Plant Dis. Reptr*, xxv, 16, pp. 412–414, 1941. [Mimeographed.]

A peculiar leaf spot with an ashen-grey, papery appearance was observed in several localities of Maryland between 24th May and 28th July, 1941, on tobacco seedlings, the disease sometimes being so severe that small areas of the beds were brown with drying leaves and dead plants. The disease was seen to spread from the bottom leaves upwards. Isolations on 3 per cent. malt agar, consistently yielded a species of *Colletotrichum* with abundant pinkish conidia, 14 by 4 μ, and numerous setae. Healthy Maryland strain 21 tobacco seedlings atomized with conidial suspensions from ten-day-old cultures developed the typical symptoms in 60 hours, and some were dead by the following day. Re-isolations from the diseased plants induced characteristic foliar and stem symptoms in a second series of inoculated seedlings, and positive results were further obtained on *Datura stramonium* and *Rumex crispus*. The exact identity of the fungus has not been determined. Previous records of a similar nature, all involving tobacco, include *C. nicotianae* from Brazil [*R.A.M.*, iii, p. 179], *C. tabacum* and *Gloeosporium nicotianae* from Germany [ibid., xi, p. 753; xii, p. 477], and *C. destructivum* from Kentucky [ibid., xiv, p. 85; xvi, p. 213].

The spots formed by the pathogen on the leaves are circular to irregular, sunken, greenish, water-soaked, later turning greyish-white, with a raised, brown margin, and measure $\frac{1}{8}$ to $\frac{1}{16}$ in. in diameter. On the midrib, lateral veins, and petioles the lesions are oblong, greenish-brown, and $\frac{1}{4}$ to $\frac{1}{2}$ in. long. The stems are also affected and break easily when pulled for transplanting. Few fructifications develop on the foliar lesions, but elsewhere they are formed in profusion.

Heuberger (J. W.) & Dimond (A. E.). **Relation of flea beetle control to control of Alternaria solani on Tomatoes.**—*Plant Dis. Reptr*, xxv, 16, pp. 415–418, 1941. [Mimeographed.]

In an experiment on tomatoes to test the value of copper compounds against early blight (*Alternaria solani*) [*R.A.M.*, xx, p. 450], the addition of derris dust to tribasic copper sulphate, copper oxychloride, yellow cuprous oxide, red cuprous oxide dust (containing 7 per cent. metallic copper plus derris to give 0·75 per cent. rotenone content), and Bordeaux mixture (all the sprays at the rate of 1·5 lb. metallic copper per 100 gals. and derris at that of 4 lb.), reduced the total number of spots on the seventh leaf of each of the nine test plants on 28th July from 257, 251, 201, 190, and 108 to 72, 115, 49, 91, and 76, respectively, and on the tenth leaf of eight plants on 8th August from 320, 315, 254, 295, and 63 to 69, 111, 57, 105, and 36, respectively, the unsprayed controls bearing 327 and 1,010 spots, respectively. The improvement in control appears to be related in some way to the control of flea beetles (*Epitrix cucumeris*).

Thomas (W.) & Mack (W. B.). **A foliar diagnosis study of the nutrition of greenhouse Tomatoes in relation to the incidence of a disease.**—*Bull. Pa agric. Exp. Sta.* 405, 17 pp., 3 graphs, 1941.

In a study at the Pennsylvania Agricultural Experiment Station of the nutrition of greenhouse tomatoes in relation to the incidence of a disease with symptoms of *Fusarium* [*bulbigenum* var.] *lycopersici*, the method of foliar diagnosis was applied (*J. agric. Res.*, lx, pp. 811–832, 1940), involving a comparison of the intensity of nutrition and equilibrium conditions between the dominant nutritive elements in morphologically homologous leaves of diseased and healthy plants.

The plants grown in plots receiving different combinations of fertilizers containing nitrate, phosphate, and potash, without manure showed more or less marked symptoms of disease, whereas plants receiving manure in addition to fertilizers did not become diseased. The diseased plants were divided into three lots, (1) severely

infected, (2) with mild symptoms, and (3) showing no external sign of infection by 10th June. The intensity of nutrition, i.e., the sum of the percentages of the plastic elements (nitrogen, phosphoric acid, and potash) in the leaves, was calculated to be uniformly less in the foliage from all three types of diseased plants than in that of healthy ones. The lower the intensity of nutrition, moreover, the heavier was the attack of the pathogen. Qualitatively, however, considerable differences existed in the nutrition of the plants on the diseased plots. The relationships between the plastic elements and between the bases lime, magnesia, and potash are shown in trilinear co-ordinates [loc. cit.] for the composition of the nitrogen, phosphorus, and potassium units and the calcium, magnesium, and potassium units in the 16th leaf. The results indicate higher values for nitrogen and lower values for phosphorus and potassium in the leaves of diseased plants from diseased plots treated with potash and superphosphate with and without sodium nitrate than in leaves of plants from healthy plots receiving the complete fertilizer plus manure. In another diseased plot, receiving only sodium nitrate and superphosphate, lower values for nitrogen and potash, but higher for phosphoric acid, obtained in leaves from diseased plants compared with the leaves of healthy plants from the plot treated with fertilizer plus manure. Leaves from badly diseased plants of the plot receiving all elements without manure showed a progressive decrease in the calcium of the calcium-magnesium-potassium unit.

The results indicate that susceptibility is related to the mode of nutrition, and the earliest date at which disequilibrium is recognizable is 27 days after the plants are set in the beds.

Campbell (W. A.) & Davidson (R. W.). **A species of Poria causing rot and cankers of Hickory and Oak.**—*Mycologia*, xxxiv, 1, pp. 17–26, 3 figs., 1942.

A fungus causing a white rot and cankers of living hickory (*Hicoria glabra* and *H. ovata*) and several oak species in Pennsylvania, Delaware, Virginia, and North Carolina is described as a new species, *Poria spiculosa*. On hickory the cankers, which usually develop around a branch wound, most commonly resemble a nearly healed, swollen wound with protruding callus, or are prominent burl-like bodies with several vertical or irregular folds in the callus, sterile fungus material being always present in these cankers. Occasionally open cankers with a depressed centre and a prominent callus ridge are formed. A slightly protruding core of fungus material resembling the remains of a stub, which cannot properly be called canker, may be produced in the early stages of infection, probably developing later on into the typical canker. At the back of the cankers a yellow or brown mycelial plug is formed which extends some distance into the rotted wood. The rot is soft and white or slightly yellowish at first, later becoming powdery and dry. On oak the canker formation appears to be less frequent, the most common form being the inconspicuous protrusion of sterile fungus material closely resembling a branch stub. A cut through such a branch scar reveals an outer hardened fungus crust of the same colour as the bark and a softer mycelial plug which fills the cavity of the branch stub. Open cankers and burl-like bodies are also occasionally found. The rot is confined to the heartwood and is typically soft, white, and spongy, all evidence indicating that branch stubs are the usual infection points. Recent observations based on external evidence of decay seem to point to *P. spiculosa* as being one of the more important causes of decay in Atlantic coastal areas on such species of oak as *Quercus nigra*, *Q. phellos*, and *Q. rubra*, occurring less frequently in the mountain regions. The perennial sporophores of the fungus are encountered effused in patches or in a continuous mass up to 1·5 m. in length on the bark or decorticated surface of thoroughly decayed logs and snags and occasionally on the dead tops of living trees. The pore surface is brown, whitish or greyish with age, smooth when young, becoming checked and cracked with drying; the tubes 2 to

5 mm. long; the subiculum thin, usually less than 0·5 mm. thick; and the pores 6 to 8 per mm. Setae are unevenly distributed; they are bulbous at the base, not projecting strongly, 10 to 20 by 5 to 8 μ. The spores are hyaline, globose or subglobose, 3·5 to 4·5 μ in diameter; in the subiculum setae-bearing hyphae are occasionally found with sharp-pointed, short side branches.

In culture the fungus forms in 14 days an appressed, very tough, leathery, yellowish mat, 5 to 7 cm. in diameter, usually azonate, but occasionally somewhat zoned, with a woolly or finely nodulose surface and a white margin. It is closely related to *Fomes igniarius* var. *laevigatus* [*R.A.M.*, xx, p. 503] and *P. prunicola*, but can be easily separated from them in culture, as the former of these two fungi grows faster and lacks the setae-bearing hyphae, and the latter produces a softer, raised spongy mat, very distinct from that of *P. spiculosa*. From all other brown Polypores studied to date the new fungus can be separated by the setae-bearing hyphae.

CAMPBELL (W. G.). **The relationship between nitrogen metabolism and the duration of the larval stage of the death-watch beetle (Xestobium rufovillosum de G.) reared in wood decayed by fungi.**—*Bio-chem. J.*, xxxv, 10–11, pp. 1200–1208, 3 graphs, 1941.

Nitrogen estimations were carried out on a series of samples of oak sapwood decayed to various stages by *Phellinus cryptarum* [*R.A.M.*, xx, p. 141], which was shown to remove a considerable proportion of the element, much of it being transferred to the mycelium growing on the exterior of the test pieces. After the removal from the latter of the external mycelium, the dead wood, which had lost some 50 per cent. of its initial weight through decay, was found to contain significantly more nitrogen (e.g., 10 per cent.) than sound wood of similar origin. The nitrogen content of the frass of *Xestobium rufovillosum* reared in oak sapwood rotted by *P. cryptarum* was compared in three separate instances with that of the original decayed wood, and no significant differences were found between the two quantities. It is concluded that the growing larva retains in its body a minimum of 95 per cent. of the nitrogen available to it in the wood. The nitrogen in decayed, as opposed to relatively or completely sound, wood is made more accessible to the death watch beetle larvae by the softening effect of the fungus on the substratum. Less resistance is thereby encountered to boring, and the duration of the larval stage is correspondingly decreased.

THOMPSON (EDNA O.). **Morphological differences in Taphrina coerulescens upon different species of Quercus.**—*Kans. Univ. Sci. Bull.*, xxvi, 6, pp. 357–366, 2 pl., 1939. [Received February, 1942.]

An examination of the asci of *Taphrina coerulescens* on various species of oak [*R.A.M.*, xxi, p. 232] showed the dimensional range to extend from 30 to 120 μ in length and 11 to 34 μ in width instead of from 40 to 80 by 15 to 25 μ, as hitherto reported in the literature. The largest asci were found on *Quercus geminata*, *Q. coccinea*, and *Q. douglasii*, and the smallest on *Q. cerris*, *Q. macrocarpa*, and *Q. undulata*. The shape of the asci was also found to vary according to the host. Commonly their bases are gradually tapered and thus wedged closely between adjacent epidermal cells of the host, but the asci formed on *Q. kelloggii* or *Q. alba* are blunt or slightly rounded at the base, while those on *Q. borealis* and *Q. cerris*, for instance, are often furnished with rhizoidal elongations which may clasp the host cells. Observations have been made in Kansas pointing to the existence of physiologic specialization in *T. coerulescens*, but further studies are necessary to determine the extent of this phenomenon.

From an examination of type material of *T. rubrobrunnea* (Pk) Sacc. the author concludes it is a synonym of *T. coerulescens*. On the other hand, *T. kruchii* [ibid.,

xvi, p. 563] on *Q. ilex* should be maintained as a distinct species, on account of its capacity to induce the formation of witches' brooms on its host.

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Numerous fungi, of which 22 are described in this paper (supplemented by a three-page bibliography), were found to be associated with cankers, deep wood infections, die-back, and twig blight of oaks (*Quercus* spp.) in nursery, shade, and ornamental plantings and native stands in Illinois [*R.A.M.*, xx, p. 183]. The organisms most consistently isolated from cankered trees were *Dothiorella quercina*, *Coryneum kunzei*, *Cytospora* (*Valsa*) *intermedia*, *Nummularia clypeus*, *Diatrype stigma*, *Phomopsis quercina*, *Phoma aposphaerioides*, *P. quercina*, *Fusicoccum ellisianum*, *Sphaeropsis quercinum*, and *Bulgaria inquinans*, while die-back was specifically attributable to *Coniothyrium truncisedum* and *Pyrenochaeta minuta* n.sp. *Armillaria* was prevalent as a cause of root rot; *Cylindrosporium quercinum* n.sp. was found fruiting in the diseased tissues of one specimen of *Q. imbricaria* suffering from die-back; *Rhodosticta quercina* n.sp. was observed causing a similar trouble in a single specimen of *Q. palustris*; an unidentified species of *Cephalosporium*, characterized by capitate, hyaline, ellipsoid to ovoid, sessile conidia, 2 to 3 by 1·5 to 2 to 7·5 to 10 by 3 to 3·5 (mean 3 to 4 by 1·5 to 2) μ, borne on simple, hyaline, filiform conidiophores, 250 to 300 by 2 to 3 μ, was obtained in pure culture from 27 specimens of *Q. alba*, *Q. velutina*, *Q. imbricaria*, and *Q. borealis maxima*; *Nigrospora spherica* (previously observed by H. A. Harris on elm [ibid., xii, p. 125]) caused twig blight of *Q. stellata* and *Q. palustris*; a species of *Cunninghamella* isolated (apparently for the first time in the case of oak) from die-back of *Q. borealis maxima*, formed on maize meal agar tan, straight or curved, conidiophores, 75 to 300 by 4 to 6 μ, on which are borne tan, globose, echinulate conidia, 2·9 to 3·3 μ in diameter; *Pestalozzia clavispora* was the agent of leaf and petiole blight of *Q. velutina*; *Chaetomium globosum* [ibid., xxi, p. 89] was isolated from the discoloured live wood of *Q. alba*; an *Alternaria* with dark brown to nearly black conidia, 9 to 46 by 6 to 12 (21 by 9) μ, with 1 to 6, usually 3 to 4, transverse, and up to 3 longitudinal, septa, was frequently obtained from the diseased bark and occasionally from the blighted petioles of various species of oak, and in one instance (*Q. alba*) from the live wood, in association with *N. clypeus* canker; and a *Penicillium*, with ovoid to globose, hyaline, catenulate conidia, 4·4 to 4·8 by 3·4 to 3·8 μ, was isolated from living wood of *Q. borealis maxima* and *Q. alba* showing dark brown to black streaks, and from dead wood adjoining the living portion in a single case of die-back of *Q. borealis maxima* (in conjunction with *Cytospora intermedia*), other associated species being *Cephalosporium* (in *Q. borealis maxima*), *D. quercina* (in *Q. alba*), and *Phoma* in an unidentified *Q.* sp.

Pyrenochaeta minuta produces in culture a light to dark brown mycelium, with sparse, grey to light brown aerial, and abundant light to dark brown surface hyphae; scattered, globose to ovoid, sooty brown to black pycnidia, 60 to 535, mostly 60 to 100 μ in diameter, with round ostioles, 8 to 10 μ in diameter; brown, septate, straight to curved setae, tapering towards the apex, 10 to 50 by 2 to 4 μ; and hyaline, fusiform, continuous, ovoid to ellipsoid conidia, 1·5 to 4 by 0·7 to 3 μ.

Cylindrosporium quercinum is characterized by dark brown to black, pulvinate, innate, later erumpent acervuli, 530 to 1,100 μ in diameter, 130 to 400 μ in height, inhabiting an elongated, light to dark brown, diseased region of the branch, and by hyaline, acicular, continuous to uniseptate, straight or slightly curved conidia, 20 to 40 by 1 to 3 μ.

R. quercina produces on a light to dark brown, discoloured area of the branch, red, tubercular, not crustose stromata, 1,200 to 1,500 μ in diameter, 800 to 1,000 μ in height; ovoid to irregular, immersed pycnidia, 60 to 180 by 25 to 85 μ; and hyaline to subhyaline, ovoid to ellipsoid conidia, 2·8 to 3·5 by 1 to 2 μ.